UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
525 NE Oregon Street
PORTLAND, OREGON 97232-2737

F/NWR5

May 10, 2002

Lawrence Evans
Attn: Mark Gronceski
US Army Corps of Engineers
1600 Executive Parkway, Suite 210
Eugene, OR 97401

RE: Biological Opinion on the effects of issuing USACE Clean Water Act Section 404 permit #2002-00109 for construction activities at the Leaburg Dam Fish Ladders, McKenzie River, Oregon

Dear Mr. Evans:

Enclosed is the final biological opinion on the U.S. Army Corps of Engineers' (USACE) proposed issuance of Clean Water Act Section 404 permit #2002-00109 for construction activities at Eugene Water & Electric Board's (EWEB) Leaburg Dam fish ladders on the McKenzie River, Oregon. This document represents National Marine Fisheries Service's (NMFS) biological opinion on the effects of the proposed action on Upper Willamette River (UWR) chinook salmon and designated critical habitat in accordance with Section 7 of the Endangered Species Act of 1973 (ESA) as amended (16 USC 1531 *et seq*.). This consultation is also being provided to EWEB as the permit applicant.

On September 6, 2001, NMFS and the U.S. Fish and Wildlife Service (USFWS) issued a joint biological opinion on the operation of the Leaburg-Walterville Hydroelectric Project (FERC# 2496), including the conservation measures included in EWEB's Biological Report, and license amendments that were developed by NMFS, USFWS, EWEB, and FERC separated staff. On December 18, 2001, FERC issued EWEB an amended license that requires replacement of the non-functioning right bank ladder and modification of the left bank ladder at Leaburg Dam.

The proposed construction at the Leaburg Dam fish ladders prompted the need for a Clean Water Act Section 404 permit from the USACE. NMFS prepared this biological opinion in response to USACE's April 3, 2002, letter requesting formal consultation on the potential effects of issuing a Clean Water Act Section 404 permit for the Leaburg Dam fish ladders construction activities on UWR chinook salmon.

NMFS concludes in this opinion that the proposed construction activities are not likely to jeopardize the continued existence of UWR chinook salmon. The issuance of a Clean Water Act Section 404 permit for the construction activities at the Leaburg Dam fish ladders will ultimately improve passage conditions for UWR chinook salmon through the installation and modification of fish ladders at Leaburg Dam. However, NMFS also believes that the proposed action is reasonably certain to result in incidental take of UWR chinook salmon because of the detrimental effects from the capture and release of fish necessary to isolate the in-water work area, increased sediment and possible pollutant levels, and riparian habitat disruption. Thus, NMFS has included in this biological opinion reasonable and prudent measures with non-discretionary terms and conditions that NMFS believes are necessary to minimize the likelihood of incidental take associated with this project.

The enclosed biological opinion contains an analysis of the effects of the proposed action on designated critical habitat. Shortly before the issuance of this opinion, however, a Federal court vacated the rule designating critical for the Evolutionarily Significant Unit considered in this opinion. The analysis and conclusions regarding critical habitat remain informative for our application of the jeopardy standard, even though they no longer have independent legal significance. Also, in the event critical habitat should be redesignated before this action is fully implemented, the analysis will be relevant when determining whether a reinitiation of consultation would be necessary at that time. For these reasons and the need to timely issue this opinion, our critical habitat analysis has not been removed from this opinion.

This opinion also serves as consultation on Essential Fish Habitat pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation Management Act and its implementing regulations (50 CFR 600). This concludes formal consultation on the action outlined in the USACE's request. Due to the limited time frame in which to complete construction activities this season, we encourage the USACE to expedite, if possible, the issuance of the 404 permit to EWEB so that construction can be completed on schedule.

We appreciate your cooperation in completing this consultation. Please contact Mindy Simmons of my Hydro Division staff at 503-872-2854 if you have any questions about this consultation.

Sincerely,

D. Robert Lohn

D. Robert Lohn
Regional Administrator

cc: Chris Allen, USFWS
Laurie Power, EWEB
Jeff Ziller, ODFW
James Hastreiter, FERC
Dan Cary, DSL

Endangered Species Act
Section 7 Consultation

BIOLOGICAL OPINION

and

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT CONSULTATION

on the Effects of Issuance of a USACE Section 404 Permit for Construction Activities at the Leaburg Dam Fish Ladders in the McKenzie Subbasin, on Upper Willamette River Spring Chinook Salmon

Action Agency:	U.S. Army Corps of Engineers
Consultation Conducted by:	National Marine Fisheries Service Northwest Region Hydro Program
NMFS Log Number:	F/NWR/2002/00453
Date Issued:	May 10, 2002

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1. OBJECTIVE

Section 404 of the Clean Water Act requires an individual to obtain authorization from the U.S. Army Corps of Engineers (USACE) for the discharge or removal of fill into all waters of the United States, including wetlands. Section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA) requires Federal agencies, including the USACE, to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), as appropriate, to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat.

The Leaburg-Walterville Hydroelectric Project (FERC Project No. 2496) is located on the McKenzie River in Lane County approximately 20 miles east of the Eugene/Springfield metropolitan area. Figure 1-1 provides a map of the McKenzie River subbasin, showing the location of the Leaburg-Walterville Hydroelectric Project. The Federal Energy Regulatory Commission (FERC) licenses the Leaburg-Walterville Hydroelectric Project, which is owned and operated by the Eugene Water & Electric Board (EWEB). On September 6, 2001,[1] NMFS and USFWS (the Services) issued a joint biological opinion on the operation of the Leaburg-Walterville Project, under the 1997 FERC license, as reinstated and amended by FERC order dated April 27, 2000; the conservation measures as proposed in the Biological Assessment (BA) submitted by FERC; and the revised and updated license articles developed by NMFS, USFWS, EWEB, and FERC separated staff. On December 18, 2001, FERC issued a new license to EWEB that requires EWEB to replace the non-functioning right bank fish ladder at Leaburg Dam and modify the left bank ladder to enhance fish passage.

The proposed construction at the Leaburg fish ladders prompted a need for a Section 404 permit from the USACE. EWEB submitted an application for a Section 404 permit with the USACE on February 15, 2002, for its proposed construction activities at the Leaburg-Walterville Project. The USACE's proposed issuance of a 404 permit for construction activities at the Leaburg Dam fish ladders is the subject of this Endangered Species Section 7 (a)(2) formal consultation between the NMFS and the USACE.

The objective of this biological opinion is for NMFS to determine whether the USACE's proposed issuance of a Section 404 permit for EWEB's construction activities at the Leaburg Dam fish ladders in the McKenzie River subbasin, as defined in Chapter 3, is likely to jeopardize the continued existence of ESA-listed species, or result in the destruction or adverse modification of designated critical habitat. The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined by 50 CFR §402 (the consultation regulations). Procedures for

[1] The August 28, 2001, draft revised and updated license articles were used to define the related portions of the proposed action in this biological opinion.

conducting consultation under Section 7 of the ESA are further described in the Services' Consultation Handbook (USFWS and NMFS 1998). The general steps for conducting a jeopardy analysis, which correspond with the organization of this biological opinion, are described below. Formal consultation is concluded with the final issuance of this opinion.

In order for NMFS to determine whether the action is likely to jeopardize the listed species and/or destroy or adversely modify designated critical habitat, it must perform an analysis of effects that 1) defines the biological requirements and current status of the listed species (Chapter 4); 2) describes the effects of the environmental baseline within the action area (Chapter 5); 3) evaluates the effects of the proposed action on the listed species (Chapter 6); 4) considers the cumulative effects of the future state, tribal, local, or private actions that are reasonably likely to certain to occur within the action area (Chapter 7); and, 5) determines if the proposed action, together with the environmental baseline and cumulative effects, is likely to jeopardize the continued existence of the listed species within an evolutionarily significant unit (ESU) or result in the destruction or adverse modification of its designated critical habitat (Chapter 8). If the effects of the proposed action, taken together with the cumulative effects and baseline, are found to jeopardize the listed species, or destroy or adversely modify critical habitat, then NMFS must identify any reasonable and prudent alternatives to the proposed action that will avoid jeopardy or adverse modification of critical habitat.

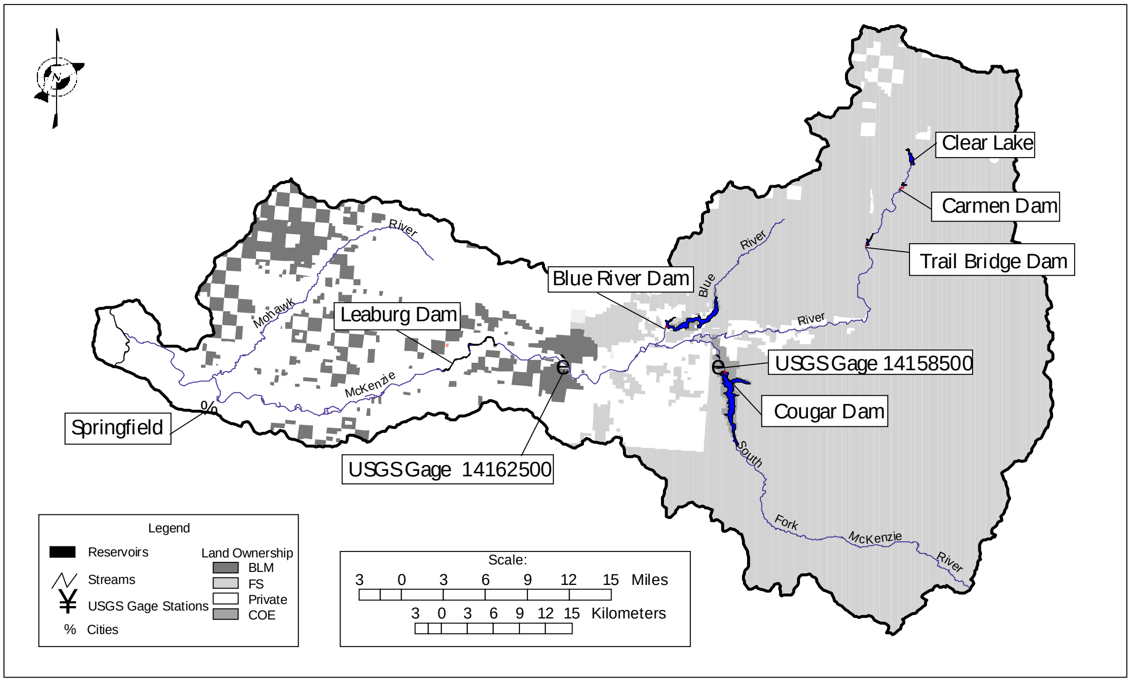

Figure 1-1. The McKenzie River subbasin, showing locations of EWEB and USACE projects.

1.1 General Approach for Jeopardy Analysis

As stated above, NMFS must determine whether the action is likely to jeopardize the continued existence of the listed species and ESU, and/or whether the action is likely to destroy or adversely modify designated critical habitat. NMFS defines an action that is "likely to jeopardize the continued existence of ..." as one "that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." NMFS defines "destruction or adverse modification" as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the survival and recovery of a listed species" (50 CFR §402.02). For salmonids, NMFS has interpreted the implementing regulations as requiring a high likelihood of survival and moderate to high likelihood of recovery when the proposed action is combined with mortality in other life stages (see Section 1.3.1.1 in NMFS 2000a).

The framework used to apply a jeopardy analysis in any given Section 7 consultation varies depending on the type of action analyzed and the availability of information regarding the effects of the action on listed species. Biological requirements may be expressed either in terms of survival rates and metrics indicating population viability or as habitat conditions necessary to ensure the continued existence of the species (NMFS 1999). NMFS asserts that these two approaches are equivalent based on studies that identify causal links between habitat modifications and population characteristics such as abundance, productivity, and diversity. This causal relationship can be quantified under certain specific conditions (e.g., Spence et al. 1996), although site-specific information is not available in the context of most Section 7 consultations. In these instances, NMFS must rely on data that can be reasonably extrapolated to the action area and to the populations in question.

In the case of this biological opinion, elements of the environmental baseline, the proposed action, and/or cumulative effects affect both direct (passage) survival at the projects and the ability of the system to provide other biological requirements (food, shelter, flow regime, substrate, etc.) of listed species. That is, the abiotic habitat processes of disturbance, flow regime, sediment and large wood (LW) function, riparian vegetation and floodplain function, and water quality (Section 2.3.3.1 in NMFS and USFWS 2001) support the fluvial (channel, riparian, and floodplain) ecosystem and, as such, create and maintain habitat for all fluvial species. NMFS uses a habitat-based framework to link effects on habitat processes with effects on the biological processes of listed species and thus their likelihood of survival and recovery. Where critical habitat has been designated (e.g., for Upper Willamette River [UWR] chinook salmon), NMFS also evaluates effects of the proposed action on its constituent elements. Cause and effect linkages between effects of the proposed action on the habitat processes and on the biological requirements of listed species are addressed in Chapter 6.

NMFS has determined that, for the purposes of this biological opinion, for UWR chinook salmon, there is enough information to quantitatively evaluate the likelihood of survival and recovery of the ESU. NMFS uses the techniques established by its Cumulative Risk Initiative to describe the status of the McKenzie River subbasin population under the environmental baseline and makes simple, determinative assumptions about the effect of the proposed action to estimate the effect on survival from one generation to the next. The purpose of this analysis is to determine whether mortality that can be attributed to the action is below a level that, when combined with mortality occurring in other life stages, results in a high likelihood of survival and a moderate to high likelihood of recovery.

In the application of this standard, NMFS relies on all the best available scientific information. However, NMFS recognizes that there is still substantial uncertainty in its projections of the likelihood of survival and recovery. As a result, NMFS relies on this analysis primarily to provide a standardized measure of risk against which to judge the significance of the action to the continued existence of the ESU. In the end, NMFS' determination of consistency with ESA Section 7(a)(2) is qualitative, informed to the extent possible by standardized quantitative analysis.

1.1.1 Metrics and Criteria Used for Assessing Jeopardy Standard

This section describes metrics integral to NMFS' quantitative evaluation of the likelihood of survival and recovery for UWR chinook salmon.

1.1.1.1 Metrics Indicative of Survival

For the survival component of the jeopardy standard, a measurement of the risk of absolute extinction (no more than one fish returning over the number of years in a generation) within 100 years is relevant (McClure *et al.* 2000b). NMFS evaluates the status of the species relative to a standardized criterion of 5% probability of absolute extinction in assessing whether the species has a high likelihood of survival under the proposed action. A 100-year period captures both short- and long-term risk because a population that has a certain probability of extinction within a short time frame, such as 24 years, will have at least that probability of extinction in 100 years. NMFS also reviews a 24-year period for two reasons: 1) because the range of uncertainty around an estimate of the 100-year metric is quite large and 2) because there is potential to further modify the action in the near term through the adaptive management process (if monitoring and evaluation indicate a need for further action to avoid longer-term risks). Absolute extinction is used instead of a quasi-extinction level because of the unambiguous interpretation of this criterion, whereas quasi-extinction levels such as 20, 50, or 100 fish have different meanings for populations of different sizes and capacities in different river systems.

1.1.1.2 Metrics Indicative of Recovery

The recovery metric stated in the 1995 FCRPS Biological Opinion (NMFS 1995) is a relevant measure of the status of the species relative to the recovery component of the jeopardy standard.

This recovery metric is defined as the likelihood that the 8-year geometric mean abundance of natural spawners in a population will be equal to or greater than an identified recovery abundance level. Recovery abundance levels have not been finally determined for UWR chinook salmon. Until recovery levels are determined, NMFS will rely on a combination of the survival criterion and an alternate recovery criterion defined as the level of improvement needed in the productivity of the population to result in a median annual population growth rate (lambda) greater than 1.0 over 48 years. NMFS applies this alternative recovery metric because the recovery abundance level may not yet be specified, but it is certainly higher than the current abundance level. Therefore, at a minimum, a population must be increasing at least slightly to recover.

1.2 Spatial and Temporal Scales of the Jeopardy Analysis

In this biological opinion, NMFS looks at both short-term and long-term and small and large spatial-scale effects of the proposed action on direct survival at the projects and on habitat and related biological processes. Actions lasting for even a short period of time, or affecting only a small portion of the action area, can have some degree of adverse effect on habitat processes that support numbers, reproduction, and distribution. NMFS must use its professional judgment to determine whether this type of adverse effect, when added to the current status of the species and its habitat in the action area (environmental baseline) and to the effects of other foreseeable non-Federal actions (cumulative effects), would be sufficiently significant to constitute jeopardy.

1.3 Application of the Basinwide Strategy in the Absence of Recovery Plans

This opinion is a formal consultation between NMFS and the USACE as required under Section 7 of the ESA. It is not a recovery plan for UWR chinook salmon. Recovery planning to meet ESA requirements for listed species in the Willamette Basin is underway. Recovery plans for listed species call for quantified de-listing goals, measures necessary to meet those goals, and estimates of the time and cost required to carry out those measures.

In May 2000, NMFS convened a Technical Recovery Team (TRT) to develop de-listing goals for UWR chinook salmon, UWR steelhead, Lower Columbia River (LCR) steelhead, LCR chinook salmon, and Columbia River (CR) chum salmon. The TRT expects to have draft products during spring 2002. The process of identifying measures needed in each stage of the anadromous salmonid life cycle for recovery of the ESUs will involve additional stakeholders, but a formal group to address that aspect of recovery has not yet been convened.

1.4 Term of this Biological Opinion

The issuance of a Section 404 permit to EWEB constitutes the USACE's "proposed action." Therefore, the term of this biological opinion is equal to the duration of permit coverage. Construction at the Leaburg Dam fish ladders is expected begin in May 2002 and continue through late October 2003. This biological opnion will be effective through the completion of all construction activities covered by the issued 404 permit.

2. BACKGROUND

This chapter identifies the listed species likely to be affected by the proposed action, and describes the consultation history of the Leaburg-Walterville Project and the relationship of thisbiological opinion to previous biological opinions.

2.1 Listed Species

A total of seven species occurring in the McKenzie subbasin are currently listed under the ESA. Of these species, the UWR chinook salmon is within the jurisdiction of NMFS. Because the USACE's BA concluded that the proposed action is likely to adversely affect UWR chinook salmon, the USACE requested formal consultation with NMFS.

The listing of anadromous salmonids under the ESA is complicated by intraspecific diversity and historical hatchery practices. Populations that meet NMFS' interpretation of the ESA's criteria for a "Distinct Population Segment" are designated as ESUs (NMFS 1991). An ESU is often composed of a seasonal run of both native hatchery- and naturally-produced fish of a given species, located within a discrete geographic area below natural barriers; the Upper Willamette River (UWR) chinook salmon ESU includes hatchery- and naturally-produced spring chinook salmon above Willamette Falls and in the Clackamas River subbasin. However, only the naturally-spawned fish are protected under the ESA because of their small numbers. Most spring chinook that currently pass Willamette Falls are hatchery-produced and these adults are not protected even though they are part of the UWR chinook salmon ESU (64 FR 14308). Fall chinook salmon above Willamette Falls are not native (i.e., they did not occur there naturally before the first fishway was built in 1885); thus, they are not part of the UWR chinook salmon ESU. In summary, in this opinion, the term "UWR chinook salmon" refers only to the naturally-spawned, spring-run component of the ESU.

2.2 Consultation History and Relationship to Other Biological Opinions

In 1997, FERC issued a license to EWEB for operation of the Leaburg-Walterville Hydroelectric Projects. On April 27, 2000, FERC issued an Order on Remand to amend the license to include NMFS' fishway prescriptions, but ESA consultation had not yet been completed. On May 25, 2000, NMFS requested rehearing from FERC, since the April 27, 2000, Order was issued without ESA consultation. On February 14, 2001, FERC requested formal consultation with NMFS, and the Services issued a joint biological opnion on September 6, 2001, addressing effects of project operation on listed species in the project area. On September 7, 2001, EWEB, NMFS, and USFWS submitted a settlement agreement to FERC. On December 18, 2001, FERC approved the settlement agreement and incorporated it and the terms and conditions of the biological opinion into EWEB's new license. The September 6, 2001, biological opinion addressed both short- and long-term effects of the new license on ESA-listed species and associated critical habitat. However, detailed construction plans for structural modifications at the project were not available at the time the biological opinion was issued. Thus, the opinion did not address the effects of specific construction activities on listed species. Since the issuance of the 2001 biological opinion, EWEB has completed construction plans and plans to begin construction during spring and summer 2002.

On February 15, 2002, the USACE and the Division of State Lands (DSL) received a Section 404 (Clean Water Act) permit application from EWEB for construction activities at the Leaburg-Walterville Project. Along with the application, EWEB submitted detailed construction plans for the structural modifications required by the new license and a biological report describing the project's effects on listed species. The USACE submitted EWEB's Biological Report (EWEB 2002) with its request for formal consultation.

On March 21, 2001, NMFS issued a Programmatic Biological Opinion on 15 Categories of Construction Requiring Department of the Army Permits in Oregon (15 Categories Programmatic Opinion). In the 15 Categories Programmatic Opinion, reasonable and prudent measures were outlined for 15 specific categories of construction activities frequently requiring permits from the USACE (NMFS 2001). Most of the proposed construction at the Leaburg-Walterville Project corresponds to one or more categories covered by the 15 Categories Programmatic Opinion. Whenever possible, reasonable and prudent measures from the 15 Categories Programmatic Opinion were incorporated into EWEB's application for a Section 404 permit for construction activities at the Leaburg Dam fish ladders.

3. Proposed Action

The USACE proposes to issue wetlands fill permit #2002-00109 under Section 404 of the Clean Water Act to EWEB for construction activities at the Leaburg Dam fish ladders. This proposal is the subject of this ESA Section 7 consultation. The following sections contain a brief description of the Leaburg-Walterville Project and more detailed descriptions of the specific construction activities at the Leaburg Dam fish ladders to be covered under the proposed permit.

3.1 Description of the Leaburg-Walterville Project

The design and operation of the Leaburg-Walterville Hydroelectric Project, described in detail in the Leaburg-Walterville relicensing BA (FERC 2001) and hereby incorporated by reference, are briefly summarized below. The project consists of the Leaburg and Walterville developments, two separate hydroelectric facilities operated independently of one another. The Leaburg Dam and powerhouse are approximately 28 and 23 miles, respectively, east of the Eugene/Springfield metropolitan area. The Walterville Canal intake and powerhouse are approximately 17 and 13 miles, respectively, east of the metropolitan area.

The Leaburg development was completed in 1930 and consists of a dam, a 5-mile-long, 15-foot deep unlined canal (Leaburg Canal), forebay, penstocks, powerhouse, tailrace, and substation. Leaburg Dam is a reinforced concrete and steel structure approximately 400 feet long and 22 feet high. The dam is equipped with three 100-foot by 9-foot rollgates, a sluiceway, and intake gates that divert water from the McKenzie River. The impounded area behind the Leaburg Dam (Leaburg Lake) extends about 1.5 miles upstream and covers an area of about 57 acres. Water diverted at the dam for power generation passes through a downstream migrant fish screen facility and enters the Leaburg Canal leading to the Leaburg forebay and powerhouse. The downstream migrant fish screen structure is located near the head end of the canal and consists of three steel V-shaped screen bays.

The Walterville development was completed in 1911 and consists of a headworks, a 4-mile-long, 14-foot deep unlined canal (Walterville Canal), a pumped storage pond, a forebay, a penstock, an automated powerhouse, a tailrace, and a substation. Water inflow to the canal is controlled by a headworks structure containing two 13-foot by 20-foot taintor gates. At most river flows, water from the McKenzie River is diverted by gravity without the use of a dam or river obstruction. The cut-and-fill unlined canal, widened and deepened in 1949 to its present dimensions, originates on the right bank (facing downstream) of the McKenzie River and flows westerly into the forebay. Water is returned from the powerhouse to the McKenzie River through a two-mile tailrace canal, part of which is an old meander channel of the river.

The Leaburg-Walterville Project is operated on a base load, run-of-the-river basis. River flows are partially controlled upstream by USACE facilities. Under normal operation, approximately 2,500 cfs is diverted into either project canal from the McKenzie River, with the balance of flow (in compliance with minimum flows imposed by FERC license conditions) continuing down the main river channel. As flows recede, diversion into the canals is reduced to maintain the licensed minimum in the river or minimum flows stipulated in an agreement reached voluntarily by EWEB with ODFW. The Leaburg-Walterville Project diverts water from two sections of the McKenzie River: 1) a 5.8-mile stretch of river between the Leaburg Dam and the point of confluence with the Leaburg tailrace, referred to as the Leaburg bypass reach; and 2) a 7.3-mile section between the Walterville intake and the point of confluence with the Walterville tailrace, referred to as the Walterville bypass reach.

The Leaburg development is equipped with a fish ladder and screen operated year-round to allow passage of fish both upstream and downstream around the dam. The ladder needs occasional cleaning, which usually can be accomplished with a one- or two-day shutdown. Routine maintenance is scheduled at times of lowest upstream fish migration. The Walterville development does not have a fish screen at the canal intake. Canal flow restrictions and/or complete intake closures are used to provide some protection to downstream migrating juvenile salmon.

The December 18, 2001, amended FERC license requires EWEB to replace the non-functioning right bank fish ladder at Leaburg Dam and rebuild the left bank ladder. The construction schedule, also specified in the FERC license, requires that the right bank ladder be rebuilt by November 13, 2002, and that the left bank modifications be completed by October 29, 2003.[2]

3.2 Proposed Action

The proposed action in this biological opinion is the issuance of a USACE 404 permit for dredge and fill activities as described in EWEB's 404 permit application (Appendix A), filed on February 14, 2002, for FERC-approved construction activities at the Leaburg Dam fish ladders. EWEB's permit application also included construction activities at the Walterville Canal, but because the USACE will address construction activities at the Walterville canal in a separate 404 permit, they are not discussed in this biological opinion. Specific construction activities (including those involving in-river work) are described below, by project location. The USACE's 404 permit will also include a requirement that EWEB implement its "Proposed Measures to Avoid, Minimize, and Mitigate for Construction-related Impacts" (referred to as EWEB's Proposed Measures). These measures are considered part of the proposed action (Section 3.3).

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[2]If construction at both the left and right bank ladders occurred concurrently, upstream passage at Leaburg Dam would not exist. EWEB submitted a single 404 permit application for both construction projects since the ladders are both located at Leaburg Dam and have similar effects on listed species and critical habitat.

3.2.1 Leaburg Right Bank Fish Ladder Reconstruction

The USACE's 404 permit will allow EWEB's work at the right bank fish ladder to proceed in the following sequence:

1) Construction of a cofferdam, access road, and temporary fish return bypass; if needed, removal of in-river boulders and rock at the downstream end of the temporary fish return bypass pipeline to create a discharge pool in the river with a 3-foot minimum depth during low river flow
2) Construction and use of a contractor's staging area between the canal and coffer dam
3) Demolition of the existing fish ladder
4) Construction of a new vertical-slot fishway
5) Modification of the existing fish bypass outfall
6) Removal of the temporary fish return pipe and outfall
7) Removal of the cofferdam

Work at the right bank fish ladder will first involve construction of an access road and clean-gravel cofferdam, behind which the area will be dewatered. A fish salvage operation will be perreformed to remove all fish from behind the coffer dam utilizing techniques described in the fish salvage plan approved by ODFW on April 16, 2002. The temporary fish return bypass pipe will be constructed concurrently with the road, as the pipe will be installed so that it runs beneath the road and to the river below the cofferdam. EWEB will demolish the existing fishway, build the new fishway, and modify the existing bypass outfall in the dewatered area behind the cofferdam. Thus, the only in-river work will consist of cofferdam and road construction, removal of boulders and rock to create a pool at the temporary juvenile fish bypass outfall, and then removal of the access road, cofferdam, and temporary juvenile fish bypass at the end of construction.

3.2.2 Leaburg Left Bank Fish Ladder Modifications

The USACE's 404 permit will allow EWEB's work at the left bank fish ladder to proceed in the following sequence:

1) Construction and use of contractor's staging area
2) Placement of a fabricated bulkhead at the fish ladder entrance
3) Modification of the ladder structure including new entrance gate

Most modifications to the left bank fish ladder will be performed on land with erosion control measures in place. The only in-water work on the left bank ladder will involve placement of a fabricated bulkhead for installation of the new entrance gate.

3.3 Environmental Protection

EWEB included numerous environmental protection measures as part of its proposed action in its Section 404 application. EWEB copied many of these measures from the Terms and Conditions of NMFS' 15 Categories Programmatic Opinion (dated March 21, 2001) on the effects of the USACE issuing permits for 15 categories of construction activities, described in Section 2.2. NMFS' 15 Categories Programmatic Opinion did not cover construction at the Leaburg Dam fish ladders primarily because site constraints forced siting of the two staging areas within 150 feet of the river. Due to the close proximity of the two contractor staging areas to the river, EWEB proposed an additional project oversight and enforcement action (Section 3.3.2) to enforce the measures presented in Section 3.3.1.

3.3.1 EWEB's Proposed Measures to Avoid, Minimize, and Mitigate for Construction-related Impacts

EWEB proposed the following conservation measures in its Section 404 permit application. EWEB copied many of these measures from NMFS' 15 Categories Programmatic Opinion (dated March 21, 2001) on the effects of the USACE issuing permits for 15 categories of construction activities, described in Section 2.2.

a. Project design. EWEB will avoid, minimize, and mitigate impacts to natural resources from construction activities. The following overall project design conditions will be met.
   i. Minimum area. Construction impacts will be confined to the minimum area necessary to complete the project.
   ii. In-water work. Wherever possible, work within the active channel of all anadromous fish-bearing streams, or in systems which could potentially contribute sediment or toxicants to downstream fish-bearing systems, will be completed within the ODFW approved in-water work period[3]. Due to the length of time necessary to complete some of the facilities, some in-water construction will occur outside the in-water work guidelines, based on the schedule in Attachment 6-A (of the application attached here as Appendix A) that was developed in consultation with ODFW specifically for construction at the Leaburg and Walterville projects, and which was approved previously by NMFS, USFWS and FERC.
      (1) Work period extensions. If EWEB needs to extend the in-water work period from those identified in Attachment 6-A (of the application), including those for work outside the wetted perimeter of the stream but below the ordinary high water mark, the

[3] Oregon Department of Fish and Wildlife, *Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources*, 12 pp (June 2000)(identifying work periods with the least impact on fish) (http://www.dfw.state.or.us/ODFWhtml/InfoCntrHbt/0600_inwtrguide.pdf).

extensions must be approved by biologists from the Services.

(2) Isolation of in-water work area. During in-water work, if listed fish may be present, including incubating eggs or juveniles, and the project involves either significant channel disturbance or use of equipment instream, EWEB will ensure that the work area is well isolated from the active flowing stream within a cofferdam (made out of sandbags, sheet pilings, inflatable bags, gravel berm, etc.), or similar structure, to minimize the potential for sediment entrainment. The exceptions are the upper and lower diversions (rock drop weir structures), which need to be placed in flowing water to ensure proper elevation to divert flows to the Walterville canal, ensure proper elevations to set the 1-foot drop in water elevation between the rock weirs, and to ensure that enough small rock, i.e. gravel and fines, are present in the boulders so water does not pass through the weirs, trapping fish. Furthermore, no ground or substrate disturbing action will occur within the active channel 300 feet upstream of potential spawning habitat as measured at the thalweg without isolation of the work area from flowing waters.

(a) Fish screen. Any water intake structure authorized under an Opinion issued by the Services must have a fish screen installed, operated and maintained in accordance to NMFS' fish screen criteria.[4]

(b) Seine and release. Prior to and intermittently during pumping, EWEB will attempt to seine and release fish from the work isolation area as is prudent to minimize risk of injury.

(i) Seining will be conducted by or under the supervision of EWEB's fishery biologist and all staff working with the seining operation will have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.

(ii) ESA-listed fish will be handled with extreme care and kept in water to the maximum extent possible during seining and transfer procedures. Any transfer of ESA-listed fish will be conducted using a sanctuary net that holds water during transfer, whenever necessary to prevent the added stress of an out-of-water transfer.

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[4] Nation Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996)(guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm).

(iii) Seined fish will be released as near as possible to capture sites.

(iv) If EWEB transfers any ESA-listed fish to third-parties other than the Services personnel, EWEB will secure written approval from the Services.

(v) EWEB will obtain any other Federal, state, and local permits and authorizations necessary for the conduct of the seining activities.

(vi) EWEB will allow the Services or their designated representatives to accompany field personnel during the seining activity, and allow such representative to inspect EWEB's seining records and facilities.

(vii) A description of any seine and release effort will be included in a post-project report, as described below under measure g. ii.

(c) Sediment-laden or contaminated water pumped from the work isolation area will be discharged into an upland area where practicable providing over-ground flow prior to returning to the canal or river. Discharge will occur in such a manner as not to cause erosion. For areas where no upland area is present, e.g. the right bank fish ladder, EWEB will assure the discharge is filtered prior to being returned to the river and filtered material is not released back to the river upon removal. EWEB will not discharge into potential fish spawning areas or areas with submerged vegetation.

iii. <u>Fish passage</u>. Work will not inhibit passage of any adult or juvenile salmonid species throughout the construction period or after project completion. All culvert and road designs will comply with ODFW guidelines and criteria for stream-road crossings[5] with appropriate grade controls to prevent culvert failure due to changes in stream elevation. EWEB's construction activities will not modify channels that could adversely affect fish passage, such as by increasing water velocities.

iv. <u>Pollution and erosion control plan</u>. A Pollution and Erosion Control Plan (PECP) will be developed for each authorized project to prevent point-source pollution related to construction operations. For the Leaburg and Walterville construction activities, EWEB is required to develop and submit for FERC approval a PECP for construction and operation as

[5] Appendix A, Oregon Department of Fish and Wildlife Guidelines and Criteria for Stream-Road Crossings, in: G.E. Robison, A. Mirati, and M. Allen, *Oregon Road/Stream Crossing Restoration Guide: Spring 1999* (rules, regulations and guidelines for fish passage through road/stream crossings under the Oregon Plan) (http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/orfishps.htm).

described in license article 401. In addition to meeting the license article requirements, EWEB ensures the PECP will contain the pertinent elements listed below and meet requirements of all applicable laws and regulations:

(1) Methods that will be used to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.

(2) Methods that will be used to confine and remove and dispose of excess concrete, cement and other mortars or bonding agents, including measures for washout facilities.

(3) A description of the hazardous products or materials that will be used, including inventory, storage, handling, and monitoring.

(4) A Spill Containment and Control Plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on site, proposed methods for disposal of spilled materials, and employee training for spill containment.

(5) Measures that will be taken to prevent construction debris from falling into any aquatic habitat. Any material that falls into a stream during construction operations will be removed in a manner that has a minimum impact on the streambed and water quality.

v. <u>Temporary access roads</u>. EWEB will design temporary access roads as follows:

(1) Existing roadways or travel paths will be used whenever reasonable.

(2) A helicopter survey conducted with ODFW during the 2001 spawning season located spawning habitat; where stream crossings are essential, EWEB will avoid any spawning habitat within 1,000 feet upstream and downstream.

(3) No stream crossings will occur at known or suspected spawning areas or within 300 feet upstream of such areas where impacts to spawning areas may occur.

(4) Where stream crossings are essential, EWEB's crossing design will accommodate reasonably foreseeable risks (e.g., flooding and associated bedload and debris) to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

(5) EWEB vehicles and machinery will cross riparian areas and streams at right angles to maintain the main channel wherever reasonable.

(6) EWEB's temporary roads within 150 feet of streams will avoid, minimize and mitigate soil disturbance and compaction by clearing

vegetation to ground level and placing clean gravel over geotextile fabric.

(7) EWEB will minimize the number of stream crossings.

vi. Treated wood removal. EWEB will use the following precautions regarding removal of treated wood.

(1) No treated wood debris will fall into the water. If treated wood debris does fall into the water, it will be removed immediately.

(2) All treated wood debris will be disposed of at an approved disposal facility for treated wood.

(3) If treated wood pilings will be removed, EWEB will ensure these conditions are followed:

(a) Pilings to be removed will be dislodged with a vibratory hammer, or other means acceptable to the Services..

(b) Once loose, the pilings will be placed onto the construction barge or other appropriate dry storage location, and not left in the water or piled onto the stream bank.

(c) If pilings break during removal, the remainder of the submerged section will be left in place.

(d) Long- term disposal of the piles must be at an approved disposal area for hazardous materials of this classification.

(e) Projects involving pile removal require long-term monitoring to ensure that if altered currents expose more pile, it must also be removed.

vii. Cessation of work. EWEB will cease all project operations, except efforts to minimize storm or high flow erosion, under high flow conditions that may result in inundation of the project area.

b. Pre-construction activities. EWEB will undertake the following actions prior to significant alteration of the action area.

i. Boundaries of the clearing limits associated with site access and construction will be flagged to prevent ground disturbance of critical riparian vegetation, wetlands and other sensitive sites beyond the flagged boundary.

ii. The following erosion control materials will be onsite.

(1) A supply of erosion control materials (e.g., silt fence and straw bales) will be on hand to respond to sediment emergencies. Sterile straw or hay bales will be used when available to prevent introduction of weeds.

(2) An oil absorbing, floating boom will be available on-site during all phases of construction whenever surface water is present.

iii. All temporary erosion controls (e.g., straw bales, silt fences) will be in-place and appropriately installed downslope of project activities within the riparian area. Effective erosion control measures will be in-place at all times during the contract, and will remain and be maintained until such time that permanent erosion control measures are effective.

c. <u>Heavy Equipment</u>. EWEB will restrict use of heavy equipment as follows.

  i. When heavy equipment is required, EWEB will use equipment having the least impact (e.g., minimally sized, rubber tired).

  ii. Heavy equipment will be fueled, maintained and stored as follows.

    (1) All equipment that is used for instream work will be cleaned prior to operations below the bankfull elevation. External oil and grease will be removed, along with dirt and mud. No untreated wash and rinse water will be discharged into streams and rivers without adequate treatment.

    (2) Place vehicle staging, maintenance, refueling, and fuel storage areas a minimum of 50' horizontal distance from Walterville canal and the McKenzie River for construction of Walterville velocity barrier and Walterville fish screen, and a minimum of 50' horizontal distance from the McKenzie River for the Leaburg left bank fish ladder modification. The staging, etc. areas for Leaburg right bank fish ladder reconstruction will be within 50' of the McKenzie River. The Pollution and Erosion Control Plan developed under Section a.iv. will prevent point-source pollution of the river.

    (3) All vehicles operated within 150 feet of any stream or water body will be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected will be repaired before the vehicle resumes operation.

    (4) When not in use, vehicles will be stored in the vehicle staging area.

d. <u>Site preparation</u>. EWEB will prepare the site preparation the following manner, including removal of stream materials, topsoil, surface vegetation and major root systems.

  i. To the extent practicable, any instream large wood or riparian vegetation that is moved or altered during construction will stay on site or be replaced with a functional equivalent.

  ii. EWEB will minimize clearing and grubbing within 150 feet of any stream occupied by listed salmonids during any part of the year, or within 50 feet of any stream not occupied by listed salmonids.

  iii. Tree removal will be strictly limited.

    (1) All perennial and intermittent streams: Trees (3 inches diameter at breast height or greater) will be removed from within 150 feet horizontal distance of the ordinary high water mark only when necessary for construction of approved facilities. All trees that will be removed will be flagged.

    (2) Tree removal will be mitigated for onsite by a 2:1 replanting ratio.

iv. Whenever the project area is to be revegetated or restored, EWEB will stockpile native channel material, topsoil and native vegetation removed for the project for redistribution on the project area.

e. Earthwork. EWEB will complete earthwork, including drilling, blasting, excavation, dredging, filling and compacting, in the following manner:

i. Boulders, rock, woody materials and other natural construction materials used for the project will be obtained from outside of the riparian area.

ii. During excavation, native streambed materials will be stockpiled above the bankfull elevation for later use. If riprap is placed, native materials will be placed over the top of the riprap.

iii. Material removed during excavation will only be placed in locations where it cannot enter streams or other water bodies.

iv. All exposed or disturbed areas will be stabilized to prevent erosion.

(1) Areas of bare soil within 150 feet of waterways, wetlands or other sensitive areas will be stabilized by native seeding,[6] mulching, and placement of erosion control blankets and mats, if applicable, quickly as reasonable after exposure, but within 7 days of exposure.

(2) All other areas will be stabilized quickly as reasonable, but within 14 days of exposure.

(3) Seeding outside of the growing season will not be considered adequate nor permanent stabilization.

v. All erosion control devices will be inspected during construction to ensure that they are working adequately.

(1) Erosion control devices will be inspected daily during the rainy season, weekly during the dry season, monthly on inactive sites.

(2) If inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately, during working and off-hours, to make repairs, install replacements, or install additional controls as necessary.

(3) Erosion control measures will be judged ineffective when turbidity plumes are evident in waters occupied by listed salmonids during any part of the year.

vi. If soil erosion and sediment resulting from construction activities is not effectively controlled, EWEB will limit the amount of disturbed area to that which can be adequately controlled.

vii. Sediment will be removed from sediment controls once it has reached 1/3 of the exposed height of the control. Whenever straw bales are used, they

[6] By Executive Order 13112 (February 3, 1999), Federal agencies are not authorized to permit, fund or carry out actions that are likely to cause, or promote, the introduction or spread of invasive species. Therefore, only native vegetation that is indigenous to the project vicinity, or the region of the state where the project is located, shall be used.

will be staked and dug into the ground 5 inches (12 cm). Catch basins will be maintained so that no more than 6 inches (15 cm) of sediment depth accumulates within traps or sumps.

viii. Sediment-laden water created by construction activity will be filtered before it enters a stream or other water body. Silt fences or other detention methods will be installed as close as reasonable to culvert outlets to reduce the amount of sediment entering aquatic systems.

f. Site restoration. EWEB will restore and clean up the site, including protection of bare earth by seeding, planting, mulching and fertilizing, in the following manner.

i. All damaged areas will be restored to pre-work conditions including restoration of original streambank lines, and contours.

ii. All exposed soil surfaces, including construction access roads and associated staging areas, will be stabilized at finished grade with mulch, native herbaceous seeding, and native woody vegetation prior to October 1. On cut slopes steeper than 1:2, a tackified seed mulch will be used so that the seed does not wash away before germination and rooting occurs. In steep locations, a hydro-mulch will be applied at 1.5 times the normal rate.

iii. Disturbed areas will be planted with native vegetation specific to the project vicinity or the region of the state where the project is located, and will comprise a diverse assemblage of woody and herbaceous species.

iv. Plantings will be arranged randomly within the revegetation area.

v. All plantings will be completed prior to April 15.

vi. No herbicide application will occur within 300 feet of any stream channel as part of this permitted action. Undesired vegetation and root nodes will be mechanically removed.

vii. No surface application of fertilizer will be used within 50 feet of any stream channel.

viii. Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

ix. Plantings will achieve an 80 percent survival success after three years.

(1) If success standard has not been achieved after 3 years, EWEB will submit an alternative plan to the COE. The alternative plan will address temporal loss of function.

(2) Plant establishment monitoring will continue and plans will be submitted to the COE until site restoration success has been achieved.

g. Monitoring: Construction. Within 30 days of completing the project, EWEB will submit a monitoring report to the COE, Oregon Division of State Lands (DSL), and the Services describing EWEB's success in carrying out the proposed measures to avoid, minimize, and mitigate for construction-related impacts. This report will consist of the following information.

i. Project identification.
   (1) applicant's name;
   (2) project name;
   (3) construction activity;
   (4) compensatory mitigation site(s) (if any) by 5th field HUC and latilong;
   (5) starting and ending dates for work performed; and
   (6) EWEB's contact person.

ii. Isolation of in-water work area. All projects involving isolation of in-water work areas will include a report of any seine and release activity including:
   (1) The name and address of the supervisory fish biologist;
   (2) methods used to isolate the work area and minimize disturbances to ESA-listed species;
   (3) stream conditions prior to and following placement and removal of barriers;
   (4) the means of fish removal;
   (5) the number of fish removed by species;
   (6) the location and condition of all fish released; and
   (7) any incidence of observed injury or mortality.

iii. Pollution and erosion control. Copies of all pollution and erosion control inspection reports, including descriptions of any failures experienced with erosion control measures, efforts made to correct them and a description of any accidental spills of hazardous materials will be submitted.

iv. Treated wood pilings. Any project involving removal of treated wood pilings will include the name and address of the approved disposal area and the plan for long-term monitoring to ensure that if altered currents expose more pile, it will also be removed.

v. Site restoration. Documentation of the following conditions:
   (1) Finished grade slopes and elevations.
   (2) Log and rock structure elevations, orientation, and anchoring, if any.
   (3) Planting composition and density.
   (4) A plan to inspect and, if necessary, replace failed plantings and structures for a period of five years.

vi. A narrative assessment of the project's effects on natural stream function.

vii. Photographic documentation of environmental conditions at the project site and compensatory mitigation site(s) (if any) before, during and after project completion.
   (1) Photographs will include general project location views and close-ups showing details of the project area and project, including pre and post construction.

(2) Each photograph will be labeled with the date, time, photo point, project name, the name of the photographer, and a comment describing the photograph's subject.

(3) Relevant habitat conditions include characteristics of channels, streambanks, riparian vegetation, flows, water quality, and other visually discernable environmental conditions at the project area, and upstream and downstream of the project.

3.3.2 Oversight and Enforcement of EWEB's Proposed Measures

EWEB will have two full-time Montgomery Watson Harza (MWH) inspectors in the field monitoring construction practices, including compliance with EWEB's Proposed Measures, and the PECP.[7] Implementation of the FERC-required Quality Control Inspection Program (QCIP)[8] is designed to ensure environmental compliance quality control. The QCIP requires monthly progress reports regarding quality control of environmental protection measures, including the following: discussion of erosion control and other measures and their effectiveness; discussion of any instances where sediments or other construction discharges entered the stream(s); the extent of the discharges, an assessment of any damage to the stream(s); and corrective actions taken, including measures to prevent further problems. EWEB will also perform periodic, random site visits throughout the work period, accompanying the MWH inspectors on site inspections and ensuring thorough inspection and enforcement of environmental measures. EWEB will send email summary reports of these visits to NMFS.

EWEB will also enforce the following items from the Pollution and Erosion Control Details and Requirements found in sheet ES-1 of each contract document:

- Items 2 and 7: Requires the contractor to adjust the approved PECP as required for field conditions,
- Item 9: Requires contractor inspection of erosion control facilities after significant rainfall events,
- Items 15 and 6: EWEB can halt construction if the contractor is not maintaining proper erosion and pollution control measures and the contractor is responsible for payment of any agency-imposed fines.

[7]In an email dated April 30, 2002, EWEB amended its proposed action to include these oversight measures.

[8]The Quality Control Inspection Program (QCIP) is a general requirement of FERC, not specific to the Leaburg-Walterville License.

4. BIOLOGICAL INFORMATION

As described in Section 2.1, the UWR chinook salmon ESU includes both hatchery- and naturally-produced spring chinook salmon above Willamette Falls and in the Clackamas River, but only naturally-produced fish are protected under the ESA. Extensive biological information for ESU, provided in the BA for the relicensing of the Leaburg-Walterville Project (FERC 2001), is hereby incorporated by reference.

4.1 Biological Requirements

4.1.1 Distribution

Historically, UWR chinook salmon were widely distributed throughout the Willamette Basin, but approximately half of their spawning habitat was cut off by the construction of 13 USACE flood control dams in the 1950s and 1960s. The ESU originally had access to over 1,000 miles of stream habitat above Willamette Falls, with major subpopulations in the North Santiam, South Santiam, McKenzie, and Middle Fork Willamette subbasins (USACE 2000; FERC 2001). Most natural spawning of UWR chinook salmon now occurs within the McKenzie River subbasin, particularly above Leaburg Dam (Fig. 1-1). Significant natural production of this ESU also occurs in the North Santiam and Clackamas subbasins.

Historically, natural spawning areas in the McKenzie basin included the mainstem McKenzie River, Smith River, Lost Creek, Horse Creek, South Fork, Blue River, and Gate Creek (Mattson 1948; Parkhurst et al. 1950). ODF (1903) surveyed much of the M'Kenzie [sic] River to site a hatchery and collection rack. Their report stated that settlers and those living along the river observed salmon spawning during the months of August and September, primarily upstream of the Leaburg post office. Currently, this is the only population above Willamette Falls with any level of sustained natural production. The McKenzie River Hatchery (RKm 52), which began egg taking operations in 1902, obtained a peak collection of 25,100,000 eggs in 1935 (Wallis 1961) from an estimated 7,844 females (@ 3,200 eggs per female). Mattson (1948) estimated that there were 4,780 adults returning to the McKenzie River, and that this constituted 40% of the entire run above the Willamette Falls. Parkhurst et al. (1950) estimated that there was suitable habitat for 80,000 fish in the entire basin.

The construction of the Cougar Mountain Dam (RKm 101) in 1963 eliminated 56 Km of spawning habitat on the South Fork McKenzie River. The South Fork was generally believed to be the best salmon-producing stream in the McKenzie drainage (USFWS 1948). The Blue River Dam (RKm 88) prevented access to an additional 32 Km of spawning habitat.

4.1.2 Population Trends

There are no direct estimates of the size of the chinook salmon runs in the Willamette River basin prior to the 1940s. McKernan and Mattson (1950) present anecdotal information that the Native American fishery at Willamette Falls may have yielded 908,000 kg of salmon (454,000 fish @ 9.08 kgs). Mattson (1948) estimated that the spring chinook salmon run in the 1920s may have been five times the existing run size of 55,000 fish (i.e., in 1947) or 275,000 fish, based on egg collections at salmon hatcheries. Wallis (1961) reported a peak collection of 25 million eggs at the hatchery rack at McKenzie RM 18 in 1935. These eggs were collected from an estimated 7,844 females (3,200 eggs per female) indicating a minimum run size of 15,700 adult UWR chinook salmon above the rack that year (assuming a 1:1 sex ratio). This estimate did not include fish that spawned downstream of the rack, in the lower mainstem McKenzie River and the Mohawk River watershed, for example. The Oregon State Game Commission (OSGC) estimated that the population of naturally- and artificially-produced UWR chinook salmon in the McKenzie subbasin was 14,500 in the mid-1960s (Thompson et al. 1966).

Estimates of naturally- and artificially-produced UWR chinook salmon returns to the McKenzie River since 1970 have comprised between 10.9 % (1984) and 25.5 % (1993) of the estimated total escapement over Willamette Falls and have remained relatively steady (Table 4-1). Estimated numbers of naturally- and artificially-produced returning adults averaged 5,861 fish (16.7 %) during the period 1970-1979; 6,183 fish (13.5 %) during 1980-1989; and 6,480 fish (16.5 %) during 1990-1999 (Table 4-1; USACE 2000).

An average of 2,599 fish escaped over Leaburg Dam and into natural production areas in the upper McKenzie River during the period 1970-1979, or 44 % of the estimated total spring chinook run returning to the McKenzie River. Escapement over Leaburg Dam averaged 2,493 fish during the period 1980-1989 and 2,846 fish during 1990-1999. However, the averages were influenced by the 1990, 1988, and 1991 runs, which were the first, second, and third largest, respectively, of the period of record since 1970. Again, these totals are for naturally- and artificially-produced adults combined. Only since 1994 has ODFW estimated the proportion of naturally-produced (“wild”) adults in the population passing Leaburg Dam (Table 4-1; USACE 2000).

Table 4-1. Estimated return of spring chinook to the McKenzie River and Leaburg Dam.

Run Year	Total Escapement to McKenzie River	% of Total Escapement Over Willamette Falls	Total Escapement Leaburg Dam	Estimated % of Naturally Produced Fish in Leaburg Dam Escapement
1970	4,787	14.0%	2,991	N/A
1971	6,323	14.2%	3,602	
1972	3,770	14.4%	1,547	
1973	7,938	18.9%	3,870	
1974	7,840	17.6%	3,717	
1975	3,392	17.8%	1,374	
1976	4,275	19.3%	1,899	
1977	9,127	22.8%	2,714	
1978	8,142	17.1%	3,058	
1979	3,018	11.3%	1,219	
Mean 1970-79	**5,861**	**16.7%**	**2,599**	------
1980	4,154	15.4%	1,980	N/A
1981	3,624	12.0%	1,078	
1982	5,413	11.7%	2,241	
1983	3,377	11.0%	1,561	
1984	4,739	10.9%	1,000	
1985	4,930	14.3%	825	
1986	5,567	14.2%	2,061	
1987	7,370	13.4%	3,455	
1988	12,637	17.9%	6,753	
1989	10,020	14.5%	3,976	
Mean 1980-89	**6,183**	**13.5%**	**2,493**	-------
1990	12,743	17.9%	7,115	
1991	11,553	22.0%	4,359	
1992	8,976	21.4%	3,816	
1993	8,148	25.5%	3,617	
1994	2,992	11.5%	1,526	54% (825)
1995	3,162	15.4%	1,622	57% (933)
1996	3,640	16.8%	1,445	76% (1,105)
1997	3,110	11.6%	1,176	84% (991)
1998	3,997	11.6%	1,874	77% (1,415)
1999	4,557	11.3%	1,909	72% (1,383)
2000*	6,818		2,652	
Mean 1990-99	**6,289**	**16.5%**	**2,846**	**70% (1,109)**

*Numbers for 2000 were obtained from ODFW and added to Table 3-1 (modified from USACE 2000)

Current levels of naturally-produced adults spawning above Leaburg Dam (column 5 in Table 4-1) were estimated by ODFW based on the proportion of adipose fin-clipped fish among chinook counted passing the dam compared to the proportion among fish returning to the McKenzie Hatchery. Using this method, ODFW estimated that an average of 70 % (1,109 fish) of the adult chinook salmon passing above Leaburg Dam between 1994 and 1999 were naturally produced (Table 4-1).

For the ESU as a whole, NMFS estimates that the median population growth rate (lambda) over the base period[9] ranges from 1.01 to 0.63, decreasing as the effectiveness of hatchery fish

[9]Estimates of median population growth rate and the risk of extinction are based on population trends observed during a base period beginning in 1980 and including 1998 adult returns. Population trends are projected under the assumption that the average condition over the base period will continue into the future.

spawning in the wild increases compared to the effectiveness of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000b). NMFS has also estimated the risk of absolute extinction for the aggregate UWR chinook salmon population in the McKenzie River, above Leaburg Dam, using the same range of assumptions about the relative effectiveness of hatchery fish (Table 4-2). At the low end, assuming that hatchery fish spawning in the wild have not reproduced successfully (Hatch = 0) or that hatchery fish are 20% as effective as wild fish (Hatch = 0.2), the risk of absolute extinction within 24 or 48 years is 0.00. At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 0.85.

Table 4-2. Risk of absolute extinction (one fish per generation) in 24, 48, and 100 years for UWR chinook salmon in the McKenzie River above Leaburg Dam over a range of hatchery effectiveness values.[1]

	Hatch = 0[2]	**Hatch = 0.2**	**Hatch = 0.8**	**Hatch = 1.0**
24 years	0.00	0.00	0.01	0.01
48 years	0.00	0.01	0.18	0.28
100 years	0.01	0.10	0.72	0.85

[1] Data for relative effectiveness of hatchery fish equal to 0%, 100%, 20%, and 80% from Tables B-5, B-6, B-11a, and B-11b, respectively, in McClure *et al.* 2000b). [2] Hatch = 0 means that hatchery fish do not reproduce successfully. Hatch = 1.0 means that hatchery fish produce the same number of spawners in the subsequent generation as wild-born fish.

In Section 1.1.1, NMFS identified metrics that are indicative of the “high likelihood of survival” and the “moderate to high likelihood of recovery” species-level biological requirements. The *survival indicator criterion* is a risk of absolute extinction that is no greater than 5% over the next 100 years. The *recovery indicator criterion* is either: 1) a 50% or greater likelihood that recovery abundance levels (expressed as an eight-year geometric mean) will be achieved within 48 years, or 2) at least a 50% likelihood that the median population growth rate (lambda) over the next 48 years will be greater than 1.0. For UWR chinook salmon, recovery abundance levels have not yet been determined. Therefore, the recovery indicator criterion based on median population growth rate applies.

NMFS estimated the needed incremental change from base period survival for UWR chinook salmon to meet the survival and recovery indicator criteria (Appendix A in NMFS 2000a). These estimates were based on the UWR chinook population in the McKenzie River above Leaburg Dam. This population must achieve an incremental increase in survival of 9 to 65% (depending on the relative effectiveness of hatchery fish) to reduce the risk of extinction within the next 100 years to 5% (Table 4-3). An incremental increase in survival of >4 to >59% must occur for the median population growth rate to increase to >1.0.

Table 4-3. Needed incremental change from base period survival to achieve a 5% risk of extinction in 100 years and median population growth rate (lambda) >1.0 over 48 years for UWR chinook salmon in the McKenzie River above Leaburg Dam over a range of hatchery effectiveness values (from Tables A-3 and A-6 in NMFS 2000a).

	Historical Effectiveness of Hatchery Spawners	
Needed Change in Survival to Achieve:	**Hatch = 0.2**	**Hatch = 0.8**
5% Risk of Extinction $_{(100\ yrs)}$	9.17	65.21
Lambda > 1.0 $_{(48\ yrs)}$	>4.55	>59.48

4.1.3 Life History

UWR chinook salmon have a life history pattern that includes traits from both ocean- and stream-type life histories. The majority of juveniles emigrate as young-of-the-year in late winter/early spring and as age-1 fish in the fall. A relatively small number presently emigrate through the second spring. The ocean distribution of fish from this ESU, most of which are caught off the coasts of British Columbia and Alaska, is consistent with an ocean-type life history. Freshwater entry begins in February, the earliest return timing of chinook stocks in the Columbia Basin (USACE 2000; FERC 2001). Life history is summarized below in terms of spawning, rearing, outmigration, ocean stage, and age at maturity.

4.1.4 Spawning

Adult UWR chinook salmon begin entering the Willamette River in February. The run peaks in April and entry continues, at lower levels, through June. Adults begin entering spawning tributaries like the McKenzie River as early as mid- to late April when water temperatures begin to reach 11.1 to 12.2° C. Spawning occurs from August to early November, peaking around the third week in September through the first week in October.

After spawning, UWR chinook salmon eggs remain buried in the gravel for one to four months, depending on stream temperatures. Chinook eggs require 882 to 991 temperature units (TUs) on average before hatching (1 TU = 1˚ C above freezing for 24 h). After hatching, the alevins, or yolk-sac fry, remain in the gravel for two to three weeks (depending on stream temperatures).

4.1.5 Rearing and Outmigration

Historical studies suggest that the majority of juvenile UWR chinook salmon historically reared to age one or older in the upper Willamette River basin before outmigrating to the estuary. In the 1940s, spring chinook juveniles were found to outmigrate in the Willamette Basin at different ages and at different times of the year near Lake Oswego on the lower river: 1) age 0+ fry (length 40-90 mm) in late winter/early spring, 2) age 1+ fingerlings (length 100-130 mm) in late fall/early winter, and 3) a second spring peak of age two smolts (length 100-140 mm; Mattson 1962). Less than half of a given age class emigrated as 0+, less than half as age 1+, and less than a third as age 2. This study was conducted after the Willamette River had already been subjected to water pollution for several decades. Thus, the author suggested that, historically, juvenile UWR chinook salmon may have continued migrating throughout the summer (Mattson 1962).

Currently, naturally-produced juvenile UWR chinook salmon have two peak outmigration periods at Willamette Falls (5 miles upstream of Lake Oswego): 1) age 0+ fry in late winter/early spring; and 2) age 1+ fingerlings in late fall/early winter, a pattern similar to that observed by Mattson in the 1940s. The 0+ group may rear in the lower Willamette or lower Columbia rivers. The age at which each group enters the ocean is not known, nor is it known if survival is higher among one group or the other. Mattson (1963) found that only eight of 59 (13.5%) returning adults in the McKenzie in 1947 had entered the ocean as subyearlings, suggesting higher survival of juveniles that entered the ocean when they were older and larger. Juvenile UWR chinook appear to emigrate to mainstem areas of major subbasins, including sections of the Willamette River, in late winter and spring and to rear there until smoltification.

ODFW has collected some seine data in the upper mainstem Willamette River each year since 1991, mostly during the summer. Juveniles at various stages of development from fry to smolts have been collected from Peoria (RM 143) upstream to the mouth of the McKenzie River (RM 176). Of particular interest was the capture of numerous newly emergent chinook fry in April 1995 in the reach from Harrisburg (RM 162) to Marshall Island (RM 170). The authors concluded that these were naturally-produced fish because, at that time, hatcheries did not release fish of this size. It is likely that the fish originated from the lower McKenzie River because mainstem habitat below Peoria is less diverse with fewer islands, fewer backwater areas, and a more modified channel, characteristics that reduce its value as rearing habitat for spring chinook salmon (USACE 2000).

As described above, Mattson (1962) reported three distinct migration periods and ages of juvenile spring chinook in the lower Willamette River in the 1940s, and current patterns are similar to this in that the ages and timing of the first two groups are similar. There may have been greater changes in outmigration timing in the tributaries; based on sampling of juvenile UWR chinook salmon in the McKenzie River from 1986-1992, juvenile migration timing appears to have changed over this time period. Samples collected at various locations between 1948 and 1968 indicated that fry migration occurred primarily from March through June (USACE 2000).

In contrast, since 1980, fry have migrated past Leaburg Dam primarily during January through April, earlier than in previous years. Similarly, fingerling migration, which originally peaked during January through March now peaks during October and November. The change in juvenile migration timing may be due to the release of warm water from impoundments above spawning areas during the fall incubation period, accelerating fry emergence and movement (USACE 2000).

4.1.6 Ocean Stage and Age at Maturity

UWR chinook salmon are "Gulf of Alaska" migrants. They migrate to the north upon ocean entry and are subject to harvest in British Columbia and SE Alaska ocean fisheries. Unlike upriver Columbia spring chinook, UWR chinook appear to be highly vulnerable to ocean fisheries. Few adult Willamette spring chinook are caught in Oregon or California ocean fisheries. Commercial seasons are typically not open when the adults are off the coast of Oregon, in preparation for entering the Columbia River during January through May, and few to none, depending on the brood year, are taken off the California coast (USACE 2000).

Mattson (1962) analyzed scales taken from spring chinook salmon caught by sport fishermen in the lower Willamette River during 1946-1950, when most of the returning fish were naturally-produced and the run was comprised of a substantial number of returning adults that were five and six years old. In comparison, data from the lower Willamette River and Clackamas River fisheries in more recent years indicate that there has been a decrease in the presence of older age classes among returning adult spring chinook salmon since the late 1940s. There has been a steady decline in the proportion of older fish (i.e., age-5 and age-6) over the period 1946 to 1983. The age composition of spring chinook runs returning to the Clackamas and Willamette rivers is currently dominated by age-4 fish (USACE 2000).

4.2 Factors for Decline

4.2.1 Habitat and Hydrology

Human activities have had enormous effects on salmonid populations in the Willamette drainage. The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat (i.e., stream shoreline) by as much as 75%. In addition, the construction of 37 dams in the basin has blocked access to over 700 km of stream and river spawning habitat. Some of these dams also alter the temperature regime of the Willamette and its tributaries, affecting the timing of development of naturally-spawned eggs and fry. Water quality is also affected by agricultural and urbanization on the valley floor, as well as timber harvesting in the Cascade and Coast ranges, which contribute to increased erosion and sediment load in Willamette basin streams and rivers. The disappearance in the 1920s and 1930s of the June run was associated with a dramatic decline in water quality in the lower Willamette River. The fall run in the Clackamas River was extirpated during this same time period.

4.2.2 Hatcheries

Hatchery production began in the basin during the late nineteenth century. Eggs were transported throughout the basin so that, in terms of genotype, current populations are relatively homogeneous (although still distinct from those of surrounding ESUs). Hatchery production continues in the Willamette, with an average of 8.4 million smolts and fingerlings released each year into the main river or its tributaries between 1975 and 1994. Hatcheries are currently responsible for most of the production (90% of escapement) in the basin.

The Clackamas River currently accounts for about 20% of the production potential in the Willamette River basin with fish originating from one hatchery plus natural production areas primarily above the North Fork Dam. The interim escapement goal for that area is 2,900 fish (ODFW 1998a). However, the Clackamas River system is so heavily influenced by hatchery production that it is difficult to distinguish spawners of natural stock from hatchery origin fish. Approximately 1,000 to 1,500 adults have been counted at the North Fork Dam in recent years.

4.2.3 Other Factors for Decline

Harvest on this ESU has been high, both in the ocean and in-river. The total in-river harvest below Willamette Falls during 1991 through 1995 averaged 33% (and previously had been much higher in some years). Ocean harvest was estimated as 16% for 1982 through 1989. Total (marine and freshwater) harvest rates on UWR spring-run stocks were reduced considerably for the 1991 through 1993 brood years, to an average of 21% (ODFW 1998b).

5. ENVIRONMENTAL BASELINE

The "environmental baseline" is defined in the ESA Section 7 implementing regulations as:

> "the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process" (50 CFR §402.02).

The Consultation Handbook (USFWS and NMFS 1998) further states that the environmental baseline is:

> "an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem within the action area. The environmental baseline is a 'snapshot' of a species' health at a specified point in time."

These definitions illustrate that the environmental baseline is more than the current condition of physical habitat within the action area. The environmental baseline is the progression of the physical, chemical, and biological conditions within the action area over time that has resulted in the current status of the listed species. This section therefore includes a discussion of the status of the habitat and biological processes within the action area under the environmental baseline, describing how pre-project conditions have been modified or transformed into current conditions.

5.1 Action Area

The "action area" for a consultation is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). Because of the upstream (e.g., recycling of marine-derived nutrients) and downstream effects of the continued operation of the Leaburg-Walterville Project, the action area encompasses the entire McKenzie River subbasin (Fig. 1-1), excluding areas above EWEB's Trail Bridge Dam and USACE's Cougar and Blue River dams in the headwaters of the McKenzie, and extending down to the confluence with the Willamette River.

5.2 Status of Habitat Processes Under the Environmental Baseline

The proposed action affects the processes (described in Section 2.3.3.1 in NMFS 2001) that create and sustain habitat parameters required by listed species within the McKenzie River subbasin. The habitat processes relevant to this proposed action are disturbance, flow regime, sediment and LW function, riparian vegetation and floodplain function, and water quality. The status of these five habitat processes under the environmental baseline is described below.

The McKenzie River subbasin covers an area of approximately 1,300 square miles on the western slope of the Cascade Mountains, and the mainstem is approximately 90 miles long. The major tributaries are the South Fork McKenzie, Blue, and Mohawk rivers (Fig. 1-1). The McKenzie River originates high on the western slopes of the Cascade Range. Much of the McKenzie River subbasin is mountainous with steep ridges and a narrow band of level land in the valleys along the McKenzie and Mohawk rivers. Although the mainstems of the McKenzie River and the Mohawk River have relatively low gradients, most of the other tributaries have steep gradients in their upper reaches. The headwaters of the McKenzie River are characterized by a broad, gently sloping volcanic ridge that extends west from the steep peaks of the Three Sisters Mountains.

The profile of the upper river generally reflects the transition from resistant volcanic parent material through the more easily erodible tuffaceous sedimentary rock and glacial landforms. The channel slope decreases from 1.2% upstream of Belknap Springs to less than 0.4% through the glacial valley just upstream from the mouth of Blue River. Downstream of Blue River the channel slope remains between 0.2 to 0.4%, but the channel is tightly confined within a narrow canyon for approximately 20 miles. The slope flattens abruptly to less than 0.2% as the river enters the wide Willamette Valley.

The largest town in the subbasin is Springfield (population approximately 52,000; PSU 1998), which is also partially located in the upper Willamette and Middle Fork Willamette subbasins. There are several smaller towns and a large number of rural residents in the subbasin. The largest dams are USACE's Cougar Dam on the South Fork McKenzie (RM 4.5; completed in 1963) and Blue River Dam on the Blue River (RM 1.8; completed in 1968). The other major dams in the subbasin are EWEB's Carmen and Trail Bridge dams on the upper McKenzie River, Smith Dam on the Smith River, and Leaburg Dam on the lower McKenzie River (Fig. 1-1). In addition, EWEB diverts a large proportion of the lower McKenzie River into the unscreened Walterville Canal. Other dams and diversions withdraw water from the lower McKenzie River and its tributaries in significant amounts during the summer and fall. The floodplains and channels of the lower McKenzie and its tributaries have been simplified by riprapping and filling for agriculture, urban development, highways, and other development (EA 1991a).

Approximately 70% of the McKenzie River subbasin is public land; most of the upper subbasin is managed by Willamette National Forest (WNF) and a much smaller proportion of the subbasin is managed by the Bureau of Land Management's Eugene District (BLME). The headwaters originate in the Three Sisters Wilderness area of WNF. Cougar and Blue River dams, and most of their reservoirs, are located within WNF (Fig. 1-1). Forest road construction and timber harvest have been extensive on both public and private land in the McKenzie River subbasin. The subbasin is used extensively for recreational purposes, and the McKenzie River is one of the most popular rivers for fishing and boating in Oregon. Much of the lower McKenzie River subbasin is described in watershed analysis reports by BLME (1995, 1996, 1998), EWEB (EA 1991a, 1991b), and Weyerhaeuser (Weyco 1994). Watersheds in the upper basin are described in watershed analysis reports by WNF (WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997). In addition, the McKenzie Watershed Council (MWC) has completed an assessment of water quality and habitat for the entire subbasin (MWC 1996).

5.2.1 Disturbance

Disturbance is defined in this biological opinion as a natural disruption of 5th field HUC or larger stream channels with a recurrence interval of 10 to 100 years. The main types of disturbance (using this definition) in the McKenzie subbasin are flooding, fire, and mass wasting. Floods that recur on an average interval of every 10 years or longer are probably the most important type of disturbance for 5th field HUC or larger stream channels in the McKenzie River subbasin based on their effects and frequency, both historically and currently. Fire was historically of major importance, but fire suppression during the 20th century has reduced its role. Mass wasting, on the other hand, has probably increased in frequency during this time due to construction of dense forest road systems and timber harvest (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997; Weyco 1994). Flood control operations at Cougar and Blue River dams have decreased the magnitude and frequency of peak flow events that historically recurred every 10 to 100 years downstream of the dams. Prior to the construction of Cougar and Blue River dams, the highest flow recorded on the McKenzie River at the Vida gage was 64,400 cfs in December 1945 and flows greater than 40,000 cfs were not uncommon (USACE 2000).

Before the completion of Cougar and Blue River dams, the magnitude of floods recurring on an average interval of every 10 years (the 10-year flood) was approximately 50,000 cfs at Vida, 12 miles below the confluence of the South Fork (Fig. 5-1). Since the completion of the flood-control projects, the magnitude of the 100-year flood (i.e., a major flood) has been reduced to less than the pre-dam, 10-year flood. Another way of looking at the data represented in the graph in Fig. 5-1 is to compare the pre- and post-dam magnitude of floods at a selected recurrence interval. For example, the 10-year flood has decreased from approximately 50,000 cfs at the Vida gage before the dams to approximately 26,000 cfs after the dams at the Vida gage (Fig. 5-1). On the South Fork below Cougar Dam, the magnitude of the 10-year flood has decreased from approximately 19,000 cfs to approximately 6,000 cfs at the gage just below the dam (Fig. 5-2). The construction of EWEB's Carmen, Smith, and Trail Bridge dams in the 1960s in the upper subbasin had minimal effects on flood magnitude due to much smaller storage capacities than Cougar and Blue River dams. An indirect effect of flood control by Cougar and Blue River dams has been the encroachment into the floodplain by agriculture and other development that would have been prevented by floods in the absence of the dams.

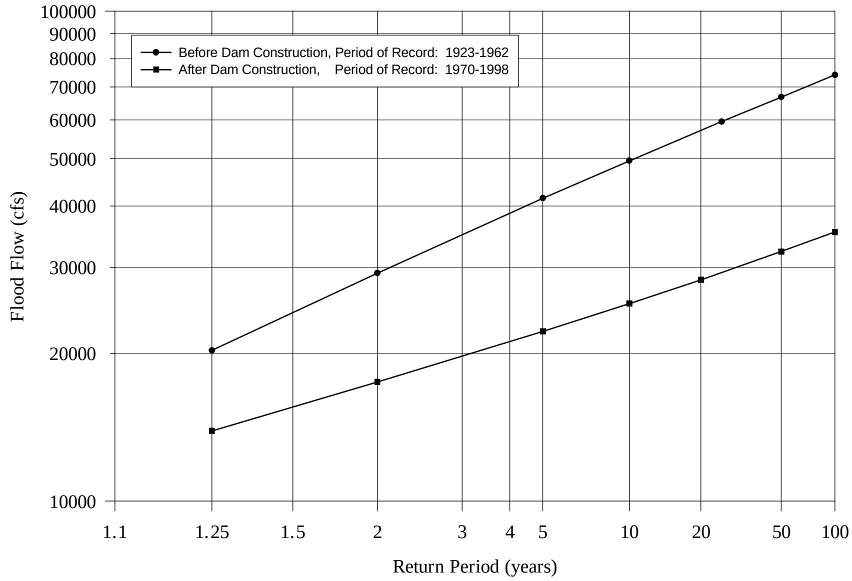

Figure 5-1. Flood frequencies at the Vida gage on the McKenzie River (USGS gage 14162500 at RM 47.7) before and after the construction of Blue River, Cougar, Carmen, Smith, and Trail Bridge dams. The gage is located 12 miles downstream of the South Fork McKenzie River's confluence with the mainstem McKenzie (from Fig. F-22 in USACE 2000).

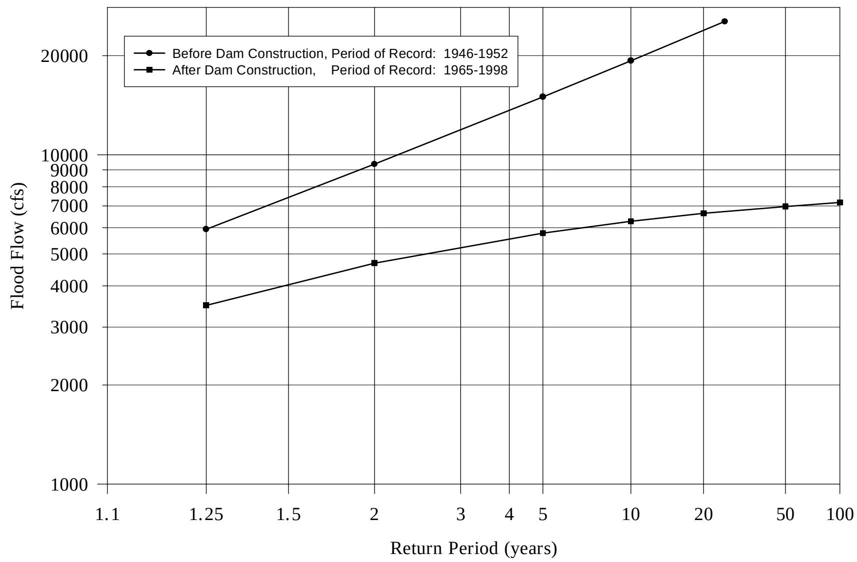

Figure 5-2. Flood frequencies at Rainbow on the South Fork McKenzie River (USGS gage 14159500 at RM 3.9) before and after the construction of Cougar Dam. The gage is one-half mile below the dam (from Fig. F-17 in USACE 2000).

Upstream of Cougar and Blue River dams and in other McKenzie River tributary watersheds, the environmental baseline with regard to disturbance is dominated by the effects of the three largest floods in the past 60 years, the 1945, 1964, and 1996 floods, combined with the effects of human activities. That is, these floods, especially the latter two, occurred after large stream channels had been considerably simplified through the results of road construction and LW removal, for example. The floods then scoured many of these stream channels and washed much of the existing substrate and LW downstream. The occurrence of these large floods in streams already altered by human activities has resulted in simplified, monotypic stream channels in much of the McKenzie subbasin above the dams and in tributary watersheds (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997).

In summary, USACE dams have reduced the frequency and size of floods in the largest stream channels from those observed historically. Fire suppression has reduced the frequency of fires and has increased fuel loads. Road construction, timber harvest, and other activities have increased mass wasting in some watersheds. The reduced frequencies and magnitude of these natural processes of disturbance, at the level of 5th field HUC stream channels, have resulted in relatively static and simplified aquatic habitat compared to the conditions under which the listed species evolved.

5.2.2 Flow regime

The McKenzie River drains an area of approximately 1,300 square miles. The highest monthly average flows typically occur from November through February, with a pronounced secondary peak in April and May due to snowmelt. Low flows occur in July through September. Vast areas of porous lava in the Cascade Range above the headwaters of the McKenzie River system retard surface runoff and act as a reservoir for large, relatively constant-flowing springs and abundant groundwater. This hydrologic feature maintains relatively high flows in the summer in the McKenzie River compared to other Willamette River basin tributaries, such as the North and South Santiam rivers. However, peak flows and low flows have been changed from historical conditions as an indirect result of human activities such as timber harvest, road construction, and fire suppression. For example, an increase in peak flows in the unregulated watersheds of the lower basin has been caused by extensive forest road construction and timber harvest (Weyco 1994; BLME 1996). As shown in Figures 5-2 and 5-3, flows in regulated streams such as the mainstem McKenzie River have been strongly affected by dams, especially the high-head storage projects, Cougar and Blue River dams (USACE 2000).

In addition to reducing the magnitude of large instantaneous peak flow events, the management of Cougar and Blue River dams for flood control has reduced the magnitude of low and moderate instantaneous peak flow events (two- to five-year events). For example, before the completion of Cougar and Blue River dams, the magnitude of floods occurring on an average of every two years (two-year event) was approximately 30,000 cfs at the Vida gage on the McKenzie River, 12 miles below the confluence of the South Fork (Fig. 5-1). Since the completion of the dams, the magnitude of the two-year event has been reduced to approximately 18,000 cfs at this gage. Another way of looking at the data represented in Fig. 5-1 is that the pre-dam, two-year event is now likely to happen only every 25 years or so. Comparisons between post-dam flows in the lower McKenzie River and flows over the same time period from an unregulated tributary (Gate Creek) show that two-year events have continued in this tributary while becoming much rarer in the mainstem McKenzie (BLME 1996).

Cougar Dam was completed in 1963 and Blue River Dam in 1968, and together they control flows from a total of 296 square miles (208 square miles and 88 square miles, respectively). The construction of these dams resulted in higher monthly average flows in the summer and fall (when reservoirs are emptied to create flood control storage) and lower flows in the spring (when reservoirs refill) below the dams. For example, prior to construction of the dams, the monthly average flow for September at the Vida gage (12 miles below South Fork confluence with the McKenzie River and 10 miles below Blue River confluence) was approximately 1,800 cfs. Since construction of the dams, the monthly average flow for September at Vida has increased to approximately 2,700 cfs. Likewise, monthly average flows below the dams have decreased in the spring. For example, prior to construction of the dams, the monthly average flow for April at Vida was approximately 5,400 cfs. Since construction of the dams, the monthly average flow for April at Vida has decreased to approximately 4,000 cfs (Fig. 5-3).

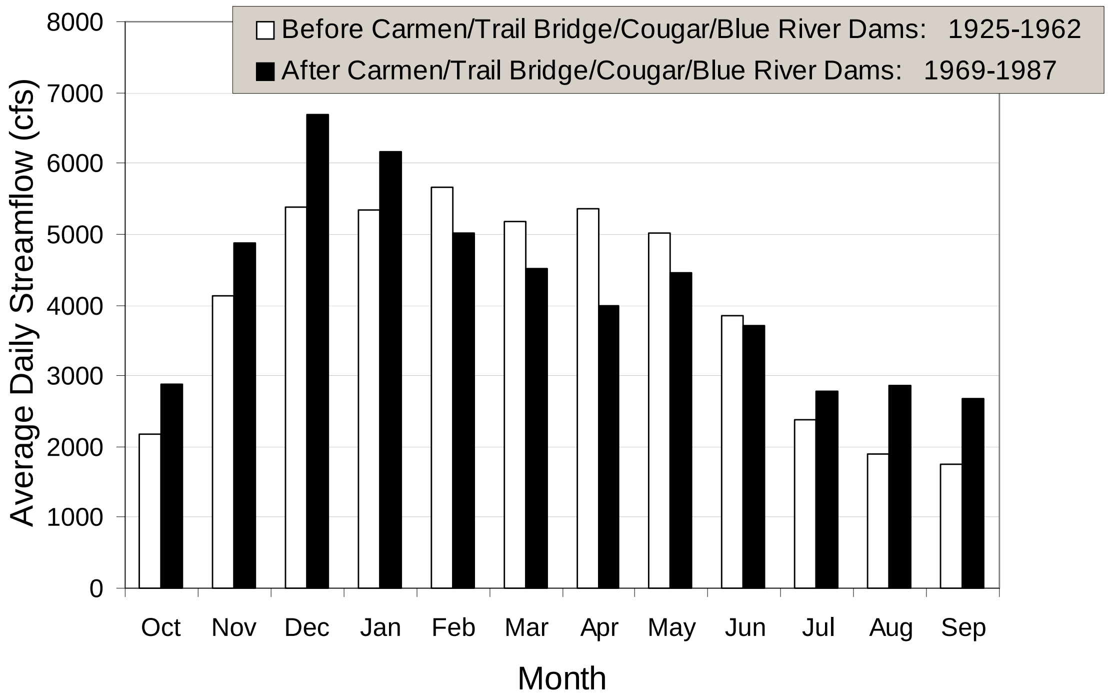

Figure 5-3. Monthly average flows at Vida on the McKenzie River (USGS gage 14162500 at RM 47.7) before and after the construction of Blue River, Cougar, and other dams. The gage is 12 miles downstream of the South Fork McKenzie River's confluence with the mainstem McKenzie (from Fig. F-58 in USACE 2000).

These changes in the flow regime below the dams are much greater on the South Fork McKenzie and Blue Rivers downstream of the dams. For example, average September flows in the South Fork below the dam have approximately tripled since dam construction, and average April flows are only one-third of pre-project flows (Fig. 5-4). From November through January when the reservoir is kept at minimum flood control pool, flows below the dam are variable in order to maintain the reservoir at this elevation to provide flood control capacity. If there is a high flow event, the reservoir level will increase to hold back the floodwaters, and the flows below the dam in the South Fork may actually decrease to 100 cfs to reduce flooding downstream of its confluence with the mainstem. From February through May, the reservoir is filled and generally 300 cfs are released into the South Fork. This is less than one-fourth of the pre-dam flow during this period, which is dominated by spring snow melt. From late May until early September, near full pool is maintained for recreation and other purposes, and 200 cfs is released to maintain minimum flows in the South Fork, that is, during a period when pre-dam flows would have been slowly decreasing. The largest departure from pre-dam flow regimes occurs in September and October, when flows in the South Fork would naturally be at their lowest until the onset of rains. This is when the USACE's reservoir is drawn back down to minimum flood control pool, resulting in South Fork flows below the dam of 800-1,000 cfs - at least twice as high as pre-project flows at this time of the year (WNF BRRD 1994; USACE 1995).

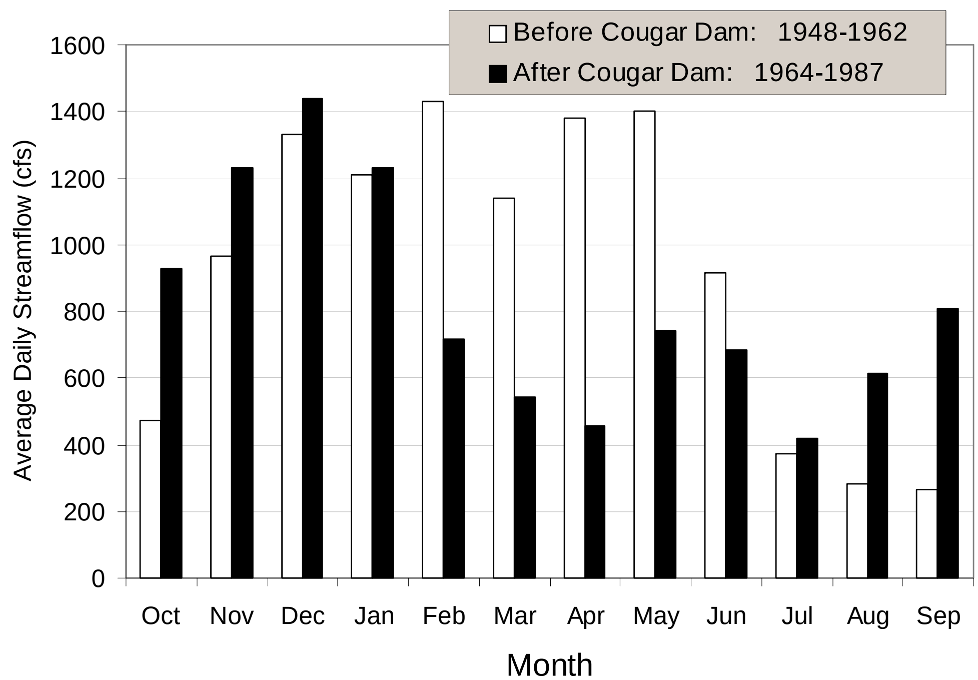

Figure 5-4. Monthly average flows at Rainbow on the South Fork McKenzie River (USGS gage 14159500 at RM 3.9) before and after the construction of Cougar Dam. The gage is one-half mile below the dam (from Fig. F-55 in USACE 2000).

After Cougar and Blue River dams, the dams that most affect the flow regime of the McKenzie River are EWEB's Carmen-Smith, Trail Bridge, and Leaburg dams on the Smith and McKenzie rivers. EWEB's unscreened Walterville Canal diverts water from the lower McKenzie without using a dam, but sometimes diverts over half of its flow (for nonconsumptive hydroelectric generation). In addition, EWEB has, on occasion, performed minor channel alterations near the Walterville intake to facilitate water withdrawal. These diversions have a smaller overall effect on flow because they have much smaller storage capacities than the USACE dams. Because the inflow into their forebays (or in the case of Walterville, canal headworks) equals their outflow from the powerhouse tailraces, these facilities are sometimes referred to as "run-of-river" projects. However, the Carmen-Smith, Leaburg, and Walterville projects divert water for several miles through canals or penstocks, depleting flows in the bypass reaches. The diverted flow amounts to a relatively large proportion of total flow during the low-flow season.

Besides EWEB's Carmen-Smith Project, the great majority of water withdrawals in the McKenzie subbasin occur downstream of Vida, both from the mainstem McKenzie as well as its tributaries. Withdrawals from the mainstem are partially compensated by storage and controlled release of water from Cougar and Blue River dams. Since storage is much less or nonexistent on tributaries of the lower mainstem McKenzie River, water withdrawals reduce flows by a larger proportion than on the mainstem. The largest withdrawals from the mainstem McKenzie River are from EWEB's Leaburg-Walterville Project. These projects both can divert over 2,400 cfs into canals several miles long for hydroelectric power generation before the water is returned to the river. Between Vida and Springfield, there are nearly 300 water rights for withdrawals from the mainstem McKenzie (124) and tributaries (170). Most withdrawals are for irrigation, but about 60 are for domestic water and the remainder are for fisheries, livestock watering, recreation, and hydroelectric power generation (BLME 1996).

In summary, USACE dams have altered the historical annual hydrograph in the largest streams by reducing peak flows in the winter and spring and by increasing low flows in the summer and fall. In streams not affected by the USACE dams, peak flows have increased due to road construction, timber harvest, and other activities, and low flows have decreased due to water withdrawals and the effects of various land-use practices.

5.2.3 Sediment and LW Function

The processes of sediment and LW function in various locations throughout the McKenzie subbasin have been characterized both by Federal agencies (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997) and others (EA 1991a; Minear 1994; Weyco 1994). The largest changes in sediment and LW function from historical conditions are evident in 6^{th} field HUC and larger stream channels in this and other Willamette subbasins. Generally, delivery of nonorganic sediment (rock and fine sediment) to stream channels upstream of dams has increased due to erosion caused by human activities, but the ability of these channels to retain sediment has decreased due to structural simplification of channels. Important agents in channel simplification have been the reduction in LW and isolation of channels from their floodplains, both caused by a variety of human activities. The current function of sediment and LW within stream channels reflects these changes, but the manner in which stream channels have responded to such changes depends on several factors such as channel type and gradient.

The relatively unconstrained, low gradient reaches of 5th and 6th field HUC streams historically were structurally complex and spatially diverse, having high densities of LW, side channels, islands, gravel bars, and pools. Upstream of the major dams in the McKenzie subbasin, these low gradient reaches have typically responded to increased sediment and decreased LW by channel widening and simplification. Constrained, high gradient reaches historically were less complex than the low gradient reaches, but LW provided sediment retention and structural complexity. With the reduction in LW, these high gradient reaches have typically responded by transporting sediment more efficiently (even when more sediment is available), resulting in widespread downcutting to bedrock or boulders/large cobbles (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997). Downstream of large dams, stream channels are deprived of all types of sediment (nonorganic and LW), thus they typically respond differently to human activities than unregulated streams.

In the mainstem McKenzie River (a 4th field HUC stream), channel bed material is generally armored and composed of cobble and larger material because the river has a large transport capacity relative to sediment availability and fine material is rapidly transported downstream. Leaburg Dam initially blocked the downstream transport of sediment in the lower McKenzie River when it was constructed in 1929, resulting in downcutting of 1-5 feet (Weyco 1994). However, Leaburg Lake has since filled in and passes gravel to spawning areas located downstream below Leaburg Dam. The five other major dams in the upper subbasin (Carmen, Smith, Trail Bridge, Blue River, and Cougar) alter the hydrology and trap sediment from over 35% of the watershed. The completion of Blue River and Cougar dams reduced the area supplying sediment to the mainstem McKenzie River by 23%. These dams act as sediment traps, with coarser material (gravel and larger rock) settling out at the head of the reservoir, and most of the finer sediment settling out within the reservoir. In addition, most woody material is prevented from going past the USACE dams and large log rafts may collect on the reservoirs after floods (USACE 2000).

In addition to trapping sediment from a large portion of the upper subbasin, the alteration in flow regime by Blue River and Cougar dams has reduced the river's ability to transport sediment produced by natural weathering processes in the upper subbasin. Prior to dam construction, peak flows with a five-year recurrence interval at the Vida gage were able to move sediments up to 150 mm in diameter, the estimated historical median particle size (Minear 1994). After dam construction, the peak flow corresponding to a five-year return interval was reduced from over 40,000 cfs to about 22,000 cfs; this flow is no longer able to mobilize the median substrate particle size (150 mm diameter). Aerial photos taken in 1945/1946 and in 1986 indicated that adjustments to these factors caused a 57% decrease in the area of exposed gravel bars and possible coarsening of mainstem substrates (Minear 1994). The sediment supply to most of the subbasin is still routed downstream through undammed reaches. Thus, the effects of armoring are localized compared to subbasins where dams entirely block the sediment supply to the mainstem.

The length of side channels in the unconfined reach downstream of the confluence with the South Fork McKenzie River (above Leaburg Dam) decreased from almost 6,000 feet in 1946 to just over 3,000 feet in 1986 (Minear 1994). The area of gravel bars also decreased during this same time period, from over 30 acres to 3 acres. These data suggest that the main channels in these reaches are downcutting and disconnecting from side channel habitats. The effects will probably continue until an armor layer develops; there are presently no data as to whether this has occurred (USACE 2000). The reach downstream of Leaburg Dam has been responding to a similar reduction in sediment supply for a longer time period. The area of islands and length of stream margin habitat decreased from approximately 540 acres and 117,000 linear feet respectively in 1930, to approximately 270 acres and 95,000 linear feet in 1990. The area of off-channel sloughs increased from approximately 39 acres in 1930 to 51 acres in 1990 (EA 1991a).

Large wood has been directly removed from stream channels of all sizes in the McKenzie subbasin during the 20th century. Large wood was directly removed from lower subbasin stream channels in the early 20th century as a result of splash damming (BLME 1995). More recently, the practice of "stream clean-out" from the 1950s to the 1970s directly reduced LW in many streams in the McKenzie subbasin. Logjams and other LW were removed from stream channels on both public and private land in a misdirected effort to improve fish passage, for timber salvage, and to reduce downstream damage during floods to bridges. Currently, LW is often removed by boaters from the mainstem McKenzie River channel to prevent navigation hazards. The subsequent simplification of stream channels allows sediment to be flushed downstream, thereby depriving the channel of material required for building streambanks and gravel bars (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997).

Construction of Cougar and Blue River dams disrupted the downstream transport of LW to downstream reaches. Wood and organic material trapped behind the dams would have eventually been transported to the McKenzie River. As evidence, the amount of LW in the McKenzie River between the confluence with the South Fork McKenzie and Leaburg Dam decreased from twelve large aggregations and three large single logs in 1930, to four aggregations and one large single log in 1991 (Minear 1994). Because Leaburg Dam is a run-of-river project, high flows pass over the spillway, allowing most LW to continue downstream rather than trapping it as occurs at Cougar and Blue River dams.

The degree to which dams disrupt the downstream transport of LW is presumed to be less severe, relative to other land use activities, in the McKenzie River subbasin, than in upper Willamette subbasins with mainstem dams. In the case of the McKenzie subbasin; the river still transports wood from unregulated tributaries. However, in the past, it was common practice for landowners and river guides to remove LW from the channel for flood control and navigation purposes or to sell pieces that were marketable (Minear 1994). Much of the in-channel LW in the mainstem near the confluence with the South Fork was removed during intensive logging of the riparian area in the 1950s. The relatively young, existing riparian stands and the disruption of downstream LW transport by Cougar and Blue River dams will continue to depress LW recruitment rates to the lower McKenzie River (Minear 1994).

In summary, both USACE dams and EWEB's Carmen-Smith Project have interrupted sediment transport in the largest stream channels, trapping it behind the dams and reducing sediment load, thus causing downcutting and substrate coarsening of these stream channels below the dams. In streams not affected by USACE or EWEB dams, road construction, agriculture, timber harvest, and other land use practices have increased sedimentation of stream channels. In nearly all 6th field HUC and larger stream channels, a combination of dams and land-management practices have reduced LW from historical levels, contributing to stream channel simplification.

5.2.4 Riparian Vegetation and Floodplain Function

The acreage covered and functional value of riparian vegetation of the McKenzie subbasin has been greatly reduced during the 20th century. Much riparian vegetation was removed for farmland, residences, timber harvest, and roads. In some cases, all woody vegetation on streambanks has been removed. For example, as of 1990, more than 11 miles of streambanks in the lower McKenzie River were protected by riprap or revetments built by USACE (USACE 2000). In the higher elevations of the subbasin, roads parallel stream channels and cut through riparian areas immediately adjacent to many streams. The construction of Highway 126 altered the McKenzie River's historical riparian character with the addition of roads, ditches, turnouts, and other road-related development. Secondary road construction and timber harvest activities in much of the subbasin have eliminated or greatly reduced riparian vegetation along most streams (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997). Cougar Reservoir inundated 1,280 acres, including 200 acres of riparian hardwoods and 1,600 acres of old-growth conifers (BPA 1985). Blue River Reservoir inundated 975 acres of stream channels, riparian forest, and upland forest (USACE 2000).

The amount of riparian habitat adjacent to the lower McKenzie River is estimated to have been reduced from 1,607 acres in the 1930s to less than 930 acres in 1990 (EA 1991b). In the lower subbasin, riparian vegetation consists of narrow, sparse stands of shrubs or trees with poor to fair near-term LW recruitment potential, and poor long-term recruitment potential, assuming current land-use practices. Riparian vegetation and future LW recruitment potential improves along an upstream gradient (Weyco 1994). In much of the subbasin, three non-native invasive species dominate riparian areas: Himalayan blackberry, Scotch broom, and reed canary grass.

Downstream of the South Fork McKenzie River, vegetation has become established on gravel bars and other surfaces that were formerly regularly inundated, making them more resistant to erosion during flooding. This has resulted in dramatic changes in channel configuration and has reduced the area of exposed gravel bars in the wide, low gradient valley downstream of the South Fork McKenzie. A reduction in the total area of gravel bars was also noted in the canyon reach downstream of the confluence with Blue River, although the number of side channels increased (Minear 1994). As with reduction in peak flows and sediment supply, establishment of vegetation on formerly unstable bars has been an agent of channel change in the McKenzie system (USACE 2000).

Historically, the lower, unconfined section of the McKenzie River downstream of Leaburg Dam contained frequent, mid-channel bars and islands, and multiple channels that periodically shifted from one side of the river to the other. Shear stress was high because the river gradient was still steep relative to discharge, and high flows were capable of transporting sediment larger than 256 mm in diameter. The river probably had an armored cobble bed within this reach, although there was substantial hydraulic roughness causing deposition of finer gravel and sand (EA 1991a). Over the entire reach of the McKenzie River below Leaburg Dam, the effects of altered flow regime and construction of flood control structures (levees and revetments) are believed to have had a greater influence on channel morphology than reduced sediment supply. Such effects and actions would serve to prevent flows capable of creating new bars and islands, constrict the channel and prevent bank erosion, and allow encroachment of perennial vegetation on formerly active bar surfaces (EA 1991a).

To provide protection from flooding, the USACE recommended in 1947 that nearly continuous levees with an average height of seven feet be constructed along the lower McKenzie River downstream of RM 22. As of 1990, more than 11 miles of streambanks in the lower McKenzie River were protected by riprap or revetments. These are located primarily along the outside of meander bends, and are concentrated in the heavily populated valley near the confluence of the McKenzie with the Willamette River. There are no levees or revetments constructed or maintained by the USACE in the vicinity of Blue River and the South Fork McKenzie River (USACE 2000). Riprap banks retard or prevent the formation of mid-channel bars and islands in the McKenzie River that are normally created and maintained by bank erosion and recruitment of sediment from streambanks. As a result, the channel form has been simplified and the bed has become comprised of an increasingly homogenous mixture of cobbles with few gravel deposits present. The dominant particle size is 152 mm and the D_{50} (average) is 119 mm, sizes approaching the maximum size used by spawning salmon and steelhead (EA 1991a).

In summary, the function of the McKenzie subbasin’s floodplains has been impaired by peak flow reduction (due to dams), sediment supply reduction (due to trapping of gravel behind dams and streambank hardening by riprap and vegetation encroachment), loss of LW, and transformation of many floodplain areas to fields, roads, buildings, and other developments. The river is not only unable to create new floodplain complexity (e.g., gravel bars, side channels, LW aggregations) during peak flows, but cannot maintain existing structural complexity. As islands, side channels, and LW are lost without being replaced, the structure of the entire stream channel simplifies. An example of stream channel and floodplain simplification along the lower McKenzie River is shown in Figure 5-5.

Riparian vegetation has been reduced by road construction, agriculture, timber harvest, gravel mining, riprap, reservoir inundation, and urbanization. Downstream of USACE dams, riparian vegetation has encroached on surfaces that were regularly inundated before the dams were built, resulting in channel narrowing and gravel bar reduction. In the lower reaches of the largest streams, formerly wide floodplains and complex stream channels have been simplified by the removal of riparian vegetation, filling of secondary channels, and other backwaters, and hardening of streambanks with riprap. These simplified conditions are maintained by the reduction in floods, sediment, and LW by the USACE and EWEB dams, as well as the hardening of streambanks and ongoing development of the floodplain.

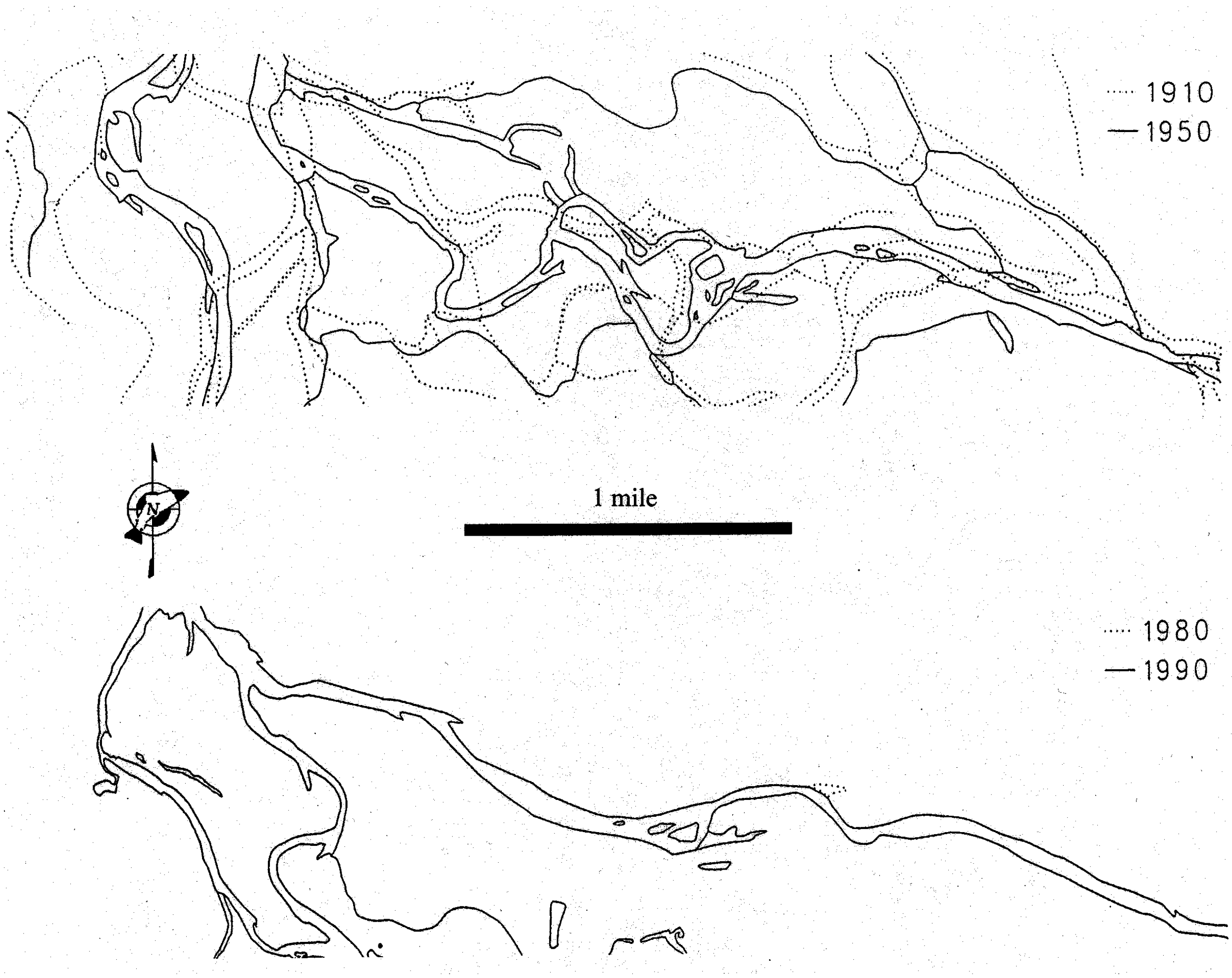

Figure 5-5. Channel simplification along the lower McKenzie River (flowing east to west through center of figures) from 1910 to 1990 at the confluence with the Willamette River (flowing south to north on left side of figures; EA 1991a).

5.2.5 Water Quality

Recently, nine reaches in the McKenzie subbasin were listed on the Oregon Department of Environmental Quality's 303(d) list for elevated summertime temperatures. The aquatic insect community in the McKenzie River basin is considered to be abundant and diverse, indicating relatively high water quality (USACE 2000). However, water temperature conditions in the summer and fall have been altered in Blue River, the South Fork, and the McKenzie River by the operation of Cougar and Blue River dams. These effects have been especially pronounced downstream of Cougar Dam in the South Fork, and have led to the current altered condition of the water temperature baseline. Cougar Dam is managed by the USACE primarily for flood control but also for secondary purposes such as recreation and instream flows. Thus, the reservoir is kept at its minimum flood control pool from November through January to provide room for potential floodwaters, then filled up nearly to full pool from February through May to provide recreation in the summer and stored water for instream flows and other purposes. The reservoir is drawn back down to minimum flood control pool in September and October to complete the cycle. Seasonal schedules for regulating reservoir elevations are commonly known as "rule curves" (USACE 1995).

Because water has been released from the bottom of Cougar Dam and water temperatures in the reservoir during the summer are strongly stratified, the water released in spring and summer is up to approximately 10°F colder (Fig. 5-6 below) than pre-project conditions in the South Fork. The water in the upper portion of the reservoir is heated throughout the summer, and as the deeper, colder water is released, the water temperature in the reservoir gradually increases and the different layers of water begin to mix. This results in water releases that warm throughout the fall when pre-project water temperatures would have been cooling, culminating in October releases to the South Fork that are up to approximately 10°F warmer than pre-project water temperatures. The resulting water temperature baseline is described in numerous reports in addition to the BA (USGS 1988; NMFS 1990; USFWS 1990, 1994; WNF BRRD 1994). USACE is planning to retrofit Cougar Dam with a water temperature control tower in 2002-2004, a proposed action for which the Services have completed formal ESA consultation (NMFS Log# OSB99-0311 and USFWS Log# 1-7-00-F-106, 2000).

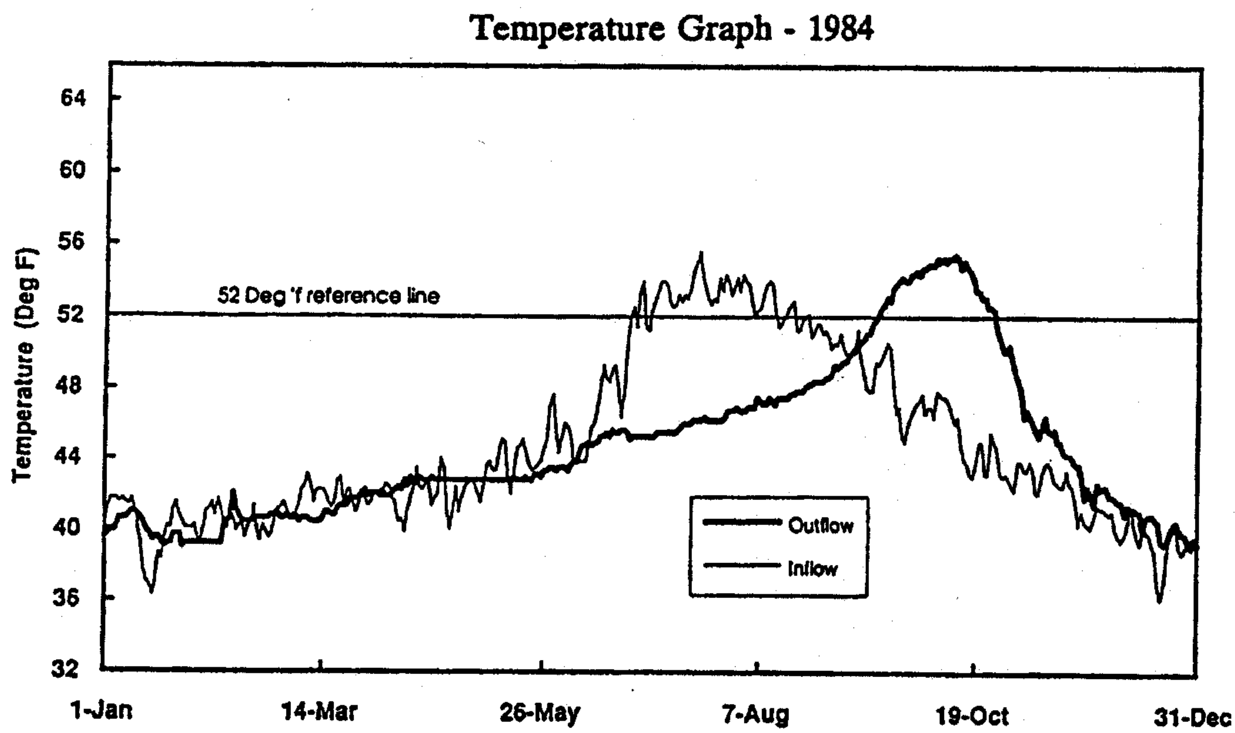

Figure 5-6. Water temperature changes in the South Fork McKenzie River caused by releases from Cougar Reservoir in 1984.

USGS (1988) studied the effects of Cougar and Blue River dams on water temperatures in the mainstem of the McKenzie River from the South Fork confluence (RM 59.7) to Vida (RM 47.7). Based on modeling for an "average" year, the study found that Cougar Dam alone resulted in a maximum water temperature decrease at Vida, compared to pre-project conditions during July through September, of 2.0°F, and a maximum increase, during October, of 2.4°F. The model showed that the average water temperature decrease due to Cougar Dam alone (compared to pre-project conditions) at Vida over 101 days in the summer and early fall was approximately 1.37°F, and the average water temperature increase over 57 days in the fall was approximately 1.75°F (Table 7; USGS 1988).

One of the Congressionally-authorized purposes of Cougar, Blue River, and the other USACE dams in the Willamette was to reduce water quality problems downstream due in part to nutrient loading (USACE 2000). Cougar and Blue River dams have contributed to the reduced nutrient loads in the lower McKenzie River and upper mainstem Willamette River by increasing summer flows and decreasing summer water temperatures. However, upstream of the dams, the blocking of salmon passage has probably had unanticipated effects on the nutrient cycles of the upper watersheds, particularly with respect to nitrogen. Unlike phosphorus, the volcanic geology of the Cascade Mountains is nitrogen-poor, thus anadromous salmonid carcasses are an important source of imported nitrogen (i.e., marine-derived) in this Cascade portion of the McKenzie subbasin ecosystem (Spence et al. 1996). For example, Triska et al. (1984) found low levels of nitrogen in all forms in a small watershed above Blue River Dam.

While the Blue River watershed above the dam supported a pre-dam annual population of less than 200 UWR chinook salmon spawners (USFWS 1965; WNF BRRD 1996), the South Fork McKenzie watershed above Cougar Dam historically supported an annual population of at least 4,000 UWR chinook spawners (USFWS 1959). Prior to 1958 (no beginning point indicated), an average of approximately 2,000 adult spring chinook salmon entered the South Fork annually to spawn. This average was more than doubled in 1958 when about 4,300 adult spring chinook salmon entered the South Fork. USFWS (1959) calculated that the spawning habitat available in the South Fork at the time would accommodate 5,360 adult spring chinook salmon. Prior to USFWS's study, the USACE estimated the South Fork could support a run of 6,000 adult spring chinook salmon, and a 1937-1938 survey by the Bureau of Commercial Fisheries (predecessor of NMFS) estimated spawning area available for "at least 13,000 salmon" (WNF BRRD 1994).

The spawner carcasses probably constituted an important source of nitrogen for the stream reaches above the Cougar damsite (and possibly above the Blue River damsite as well), thus the elimination of these carcasses by dam construction reduced nitrogen availability above the dams. This nitrogen limitation is in stark contrast to current nitrogen availability in the lower-elevation areas of the Willamette Basin, where human activities such as application of fertilizers for agriculture has resulted in an overabundance of nitrogen and other nutrients in aquatic environments (USGS 1995, 1996). This simultaneous nutrient impoverishment (highlands) and nutrient enrichment (lowlands) due to human activities is commonly observed at the subbasin and basin scales (Stockner et al. 2000).

In most streams, summertime water temperatures are higher than those observed historically due to the cumulative effects of human activities. In many of the lower elevation streams, eutrophication and contamination from agricultural practices and urbanization have degraded water quality. Downstream of USACE dams, stream temperatures have been substantially altered by management of the dams, resulting in cooler temperatures in the summer and much warmer temperatures in the fall. Upstream of USACE and EWEB dams, the elimination of salmon carcasses has reduced nutrient availability in streams.

5.3 Status of Biological Processes of UWR Chinook Salmon Under the Environmental Baseline

The proposed action affects the biological processes of UWR chinook salmon. The most relevant biological processes for listed species in the McKenzie subbasin ecosystem covered by this opinion are migration, spawning, rearing, population level processes, and food web dynamics.

In this opinion, the biological process of migration is defined as movement of an organism from one habitat to another, either for its next life history stage or in response to seasonal changes. Spawning is defined as breeding behavior and activity as well as incubation of eggs. Rearing is defined as the life history stage between emergence from incubation habitat to smoltification (for anadromous salmonids) or to development of the subadult form. Population level processes are defined as the number of reproductively mature adults within a given geographic area, survival rates of various life stages, and life history diversity (intra-population variation in the timing or location of one or more life history stages, such as the spawning of spring chinook salmon in different stream reaches and during different weeks or months within the same subbasin).

Food web dynamics is a very broad community level process that encompasses the interactions of species in the McKenzie subbasin ecosystem with one another, and includes predation, competition, and disease. The loss of historical habitats described above in Section 5.3, the introduction of exotic species, and the creation of new habitats in reservoirs and revetments have caused shifts in food web dynamics in the McKenzie subbasin ecosystem. Exotic animal and plant species may compete with native species occupying similar ecological niches for food and habitat, compete with and prey upon native species, and/or modify, reduce, or eliminate the habitat for native species. Reservoirs, revetments, and other human-created structures provide extensive habitat for exotic and native predators of listed species.

A substantial portion of spawning and rearing habitat in the McKenzie subbasin for the listed species addressed by this opinion is on Federal land (Forest Service and Bureau of Land Management). Gradual improvements in habitat conditions for these species are expected on these Federal lands as a result of Northwest Forest Plan implementation, as guided by ESA consultation, and as a result of the Basinwide Salmon Recovery Strategy (Federal Caucus 2000). The status of habitat required to support each species-specific process (e.g., habitat for chinook salmon spawning, passage conditions for migration) and the status of each of the five biological processes are described below.

The organism and population level processes of migration, spawning, rearing, and population size and life history diversity are described below for UWR chinook salmon in the McKenzie subbasin. General life history for this ESU is described in Section 4.1.1.

5.3.1 Migration

Migration refers to the movement of adult UWR chinook salmon up the McKenzie River and its tributaries on their spawning run, and the movement of juvenile UWR chinook salmon from the redds to downstream rearing habitat. UWR chinook salmon historically migrated through much of the McKenzie subbasin to take advantage of abundant spawning and rearing habitat. The mainstem McKenzie River is free of natural migration barriers to adult salmonids up to Tamolich pool at approximately RM 81 (WNF MRD 1995), above which the river is subsurface for several miles. Adult chinook salmon historically migrated up to this point in the upper mainstem McKenzie River to spawn, as well as the upper reaches of all the major tributaries such as the Mohawk River, Blue River, the South Fork McKenzie River, Horse Creek, and many smaller streams. Spawning occurred throughout these streams where habitat was available, including the mainstem McKenzie River down to the confluence with the Willamette River. Juvenile chinook salmon migrated downstream to suitable rearing habitat in all these streams and the mainstem Willamette River, depending on their life history stage and the environmental conditions (USACE 2000).

Migration conditions for chinook salmon in the McKenzie subbasin were altered from historical conditions by at least one hatchery rack (weir) on the lower mainstem, numerous dams on the mainstem and many tributaries that created barriers, and flow regimes that were altered by the dams and other human activities. One of the earliest obstructions to fish migration was a hatchery rack on the lower McKenzie River at approximately RM 18. This rack, which intercepted the entire spring chinook salmon run, was operated from 1902 through 1957 to collect eggs for a state fish hatchery. Fish spawned from this rack were used for stocking the McKenzie River system, as well as other sites in Oregon and other states. Adult passage of a portion of the population was allowed upstream past the rack starting in 1954 after a major decline in the spring chinook runs was noted (USACE 2000).

Several EWEB hydroelectric projects have altered migration conditions for chinook salmon in the mainstem McKenzie River by creating barriers to migration. Shortly after the hatchery rack began operation on the lower mainstem McKenzie River, EWEB built the Walterville Project. EWEB began diverting water in 1911 from the mainstem McKenzie River at approximately RM

28 into a 4-mile long, 14-foot deep, unscreened canal that diverted water downstream to the Walterville Powerhouse. While the canal does not block the mainstem or prevent the upstream migration of adult chinook salmon, the return flow to the river attracts adults into the tailrace canal where there is the potential for delay in their spawning migration. At the Walterville Canal intake, over 70% of the river flow can be diverted during summer when adult spring chinook may still be moving upstream, potentially hindering migration through the bypassed reach. The diversion of so much flow into an unscreened canal also potentially affects a large proportion of juveniles migrating downstream. Juveniles that move downstream through the Walterville Canal become entrained in the powerhouse flow (FERC 2001). Currently, per an agreement with ODFW, EWEB limits the entrainment mortality of chinook fry by reducing, on a seasonal basis, the amount of water diverted at the Walterville intake.

In 1930, EWEB also constructed the 22-foot high Leaburg Dam at RM 39 to divert water from the resulting 57-acre reservoir into a 5-mile long canal. The dam has two fish ladders, but only one ladder is operational. The Leaburg Canal is now fitted with juvenile fish screens and a bypass system returns juvenile fish to the McKenzie River just below the Leaburg Dam (USACE 2000). According to FERC (2001), current levels of mortality of downstream migrating fry and smolt chinook salmon passing through Leaburg Dam are low, although the results of field tests using smolts are described as inconclusive.

The construction and operation of weirs, diversions, and dams is the most obvious manner in which human activities have altered historical migration conditions for adult and juvenile chinook salmon in the McKenzie subbasin but there have been other human-induced changes. Adult chinook salmon enter the McKenzie River from late spring to early summer, then hold in deep pools until spawning in the fall. These holding pools are a critical component of migration habitat for adult chinook salmon. Sedell et al. (1992) found a 19% reduction in the number of large pools from 1937 to 1991 in the McKenzie River from RM 24 to RM 82, including an 85% reduction in the 15 RM downstream of Leaburg Dam. The important spawning tributaries of the South Fork McKenzie River and Horse Creek also had large pool reductions of 75% and 38%, respectively, during this time period. Loss of pool habitat is attributed to reductions of pool forming processes, including peak flow events and LW, and effects of forest management activities, including road building and logging.

The USACE flood control dams (Cougar and Blue River) have altered the flow regime such that late winter and spring flows are lower (Fig. 5-3 and 5-4), and water temperatures such that summer temperatures are cooler and fall temperatures are warmer than those observed historically (Fig. 5-6). The management of Cougar Dam results in colder than natural stream temperatures in August and September below the dam in the South Fork and mainstem McKenzie rivers, followed by a sudden temperature increase as the summer pool is drained such that stream temperatures are warmer than natural in October. As adult UWR chinook salmon approach the South Fork on their spawning migration in the late summer, they delay entering the stream because of the cold temperatures or spawn elsewhere. Of those that do enter the South

Fork, prespawning mortality is approximately five times as high as fish spawning in the mainstem above the mouth of the South Fork (USACE 1995; NMFS and USFWS 2000).

Because chinook salmon fry migrate in the late winter from the McKenzie subbasin, reduced flows at this time of the year could affect their migration. Less direct changes in juvenile chinook salmon migration conditions induced by human activities include water quality degradation, which prevents juvenile chinook salmon from using some historical rearing habitat in the lower subbasin (e.g., Mohawk River); and the introductions of warm-water species, which compete with or prey upon juvenile chinook salmon in the lower subbasin (e.g., sloughs off of the lower mainstem McKenzie near the Willamette confluence [USACE 2000]). Effects on the biological process of juvenile migration are also discussed under the “Rearing” and “Population Size and Life History Diversity” sections, below.

Current migration timing is as follows: returning adult UWR chinook salmon enter the McKenzie River as early as mid- to late April, when water temperatures reach 11.1-12.2°C. Migration timing of spring chinook salmon adults in the Willamette basin has been shown to be very temperature dependent. The period of peak passage above Leaburg Dam (~RM 39) occurs in the first half of June on average, but can occur as early as the second half of May in warmer water years or as late as the first part of July in cooler water years. Therefore, the timing of upstream migration to the remaining spawning habitat is probably affected by changes in water temperature caused by the dams (i.e., cold water releases from the bottom strata of USACE reservoirs during summer may delay adults, as discussed in Section 5.2.5). A smaller pulse of adults moves above the dam just prior to and during the spawning period in September. Juvenile UWR chinook salmon migrate downstream from spawning and incubation areas to the lower McKenzie River or to the Willamette River in the late winter or early spring as fry (age 0+). More than 90% of the naturally- produced juveniles captured at Leaburg Dam between 1980 and 1983 were fry (FERC 2001).

In summary, USACE dams block the upstream adult migration of UWR chinook salmon into large portions of their historical spawning habitat in the McKenzie River subbasin. In the case of Cougar Dam, a USACE project completely blocks access is to what was, historically, the most productive portion of the subbasin. The timing of upstream migration to remaining spawning habitat is probably affected by changes in water temperature downstream from the dams, caused by seasonal patterns of thermal stratification and mixing in the reservoirs. Two of the three dams comprising EWEB’s Carmen-Smith Project, Trail Bridge and Smith dams, block access to historical spawning areas (Carmen Dam is above a natural barrier to migration). Neither the Leaburg or Walterville diversions totally blocks fish passage but the structures and related facilities cause mortality of juvenile chinook fry and smolts and probably some delay in a portion of the adult migration.

5.3.2 Spawning

Historically, UWR chinook salmon spawning occurred throughout the mainstem McKenzie River and in all the major tributaries such as the Mohawk River, the South Fork McKenzie River, Horse Creek, and many smaller tributaries (BLME 1995, 1996, 1998; WNF BRRD 1994, 1996, 1998; WNF MRD 1995, 1997; Weyco 1994). Spawning in the McKenzie River started in early to mid-August and lasted as late as the third week of October, but now largely takes place during September (USACE 2000; FERC 2001). Spawning may have been especially prolific in the lower reaches of the mainstem McKenzie River. For example, in 1946-1947, spring chinook spawning occurred primarily in the lower 20 miles, near the Hayden, Coburg, and Hendrick's bridges. Chinook spawners were also located in large numbers at Wilson's Bend near the mouth and the lower section of the Walterville Canal because of the presence of a rack placed in the river to collect fish for hatchery production (Mattson 1948). Changes in UWR chinook salmon spawning strategies during the 20th century are further discussed under "Population Level Processes," below.

Currently, the McKenzie subbasin supports the largest spawning aggregation of UWR chinook salmon. Above Leaburg Dam at RM 39, an estimated 70% of the spring chinook salmon spawners passing above the dam from 1994 to 1998 were naturally produced and therefore protected under the ESA. Downstream of Leaburg Dam, most chinook salmon spawners are hatchery produced and therefore not protected (USACE 2000). Based on aerial redd surveys, approximately 10-20% of the chinook salmon above Leaburg Dam spawn in the South Fork of the McKenzie below Cougar Dam, 30-40% spawn in the mainstem McKenzie River below the confluence with the South Fork, and 45-60% spawn in headwater areas above the confluence with the South Fork up to Trail Bridge Dam (ODFW 1999a; USFWS 1994). Because these redd surveys were done from the air, redds in side channels, tributaries, and near streambanks were obscured from view by vegetation and thus probably undercounted.

Minear (1994) observed that reduced sediment supply and flow alteration by dams on the mainstem McKenzie River, Blue River, and the South Fork McKenzie River in the 1960s altered the flow regime and cut off sediment supply from the upper half of the drainage area. Aerial photographs taken in 1945/1946 and in 1986 indicated that adjustments to these factors caused a 57% decrease in the area of exposed gravel bars and possible coarsening of mainstem substrates. Sedell et al. (1992) found that the substrate in the some reaches of the mainstem McKenzie River that are still accessible to chinook salmon has coarsened in the last 60 years, although the 15-mile reach between Hendricks Bridge and Leaburg Dam actually decreased in percent large rubble (from 49 to 35%) while increasing in percents medium rubble, small rubble, and fine sediment.

Ligon et al. (1995) observed that an average of 8.5 female chinook salmon were counted per redd in a reach of the McKenzie River above Leaburg Dam during the period 1970-1986. The authors state that it is likely that spawning-gravel limitations are resulting in redd superimposition. However, the female/redd estimate was derived from Leaburg Dam counts and aerial redd counts (assuming a 1:1 sex ratio) and aerial counts in the upper McKenzie River basin have been shown to significantly under-count the number of redds based on a comparison with ODFW ground surveys (Grimes et al. 1996; Lindsay et al. 1997). This is thought to be due to the narrowing of the channel, overhanging riparian vegetation, and the propensity for chinook to spawn along the margins which inhibit the view from the air. As a result, aerial counts in the upper McKenzie basin, which could overinflate estimates of females/redd, were discontinued after 1997 (pers. comm., Tim Downey, EWEB, August 17, 2001). Further, USACE (2000) reports that only 1% of the available spawning gravel is used by chinook salmon in the mainstem McKenzie River. Thus, evidence regarding whether spawning gravels of adequate quantity and quality are available to UWR chinook salmon under the environmental baseline is inconclusive at this time.

In the tributaries of the McKenzie River, spawning habitat that is still accessible to chinook salmon has been altered by a combination of human activities. In the upper subbasin, important undammed spawning tributaries such as Horse and Lost creeks still provide abundant spawning gravels and high water quality, although these conditions have become somewhat altered by recent road construction, LW removal, and timber harvest (WNF MRD 1995, 1997). In the lower subbasin, spawning habitat has been much more affected by human activities (splash damming, irrigation diversion, and channel simplification) that started during the early 20th century (BLME 1995, 1998). As a result, chinook salmon spawning habitat in these lower subbasin tributaries has been altered through sedimentation of spawning gravels and deterioration of water quality.

The McKenzie River Trust is an Oregon non-profit corporation established in 1989 and dedicated to protecting lands in the McKenzie River watershed. The Trust is developing a scientifically-based method for identifying, evaluating, and selecting specific high quality habitat property, using the combined inputs of EWEB, the MWC, ODFW, Oregon Trout, NMFS, and others. This method includes steps that consider the habitat needs of spring chinook salmon and bull trout. EWEB has granted $500,000 to the McKenzie River Trust and pledged up to $500,000 as an additional matching grant for contributions to purchase land and/or conservation easements in the McKenzie River watershed to further watershed health objectives. These objectives include maximizing protection of critical fish and wildlife habitat of the McKenzie River, minimizing the need for future public expenditures for habitat restoration, and promoting cooperative approaches to protection of fish and wildlife habitat. The land trust will provide both short- and long-term benefits for both species of fish (FERC 2001).

In summary, most natural spawning of UWR chinook salmon takes place in the McKenzie River subbasin. Substrate coarsening has been observed at various places in the McKenzie River basin but evidence regarding whether spawning gravels of adequate quantity and quality are available to UWR chinook salmon under the environmental baseline is inconclusive.

5.3.3 Rearing

Little information is available on historical rearing strategies of juvenile UWR chinook salmon in the McKenzie subbasin. Juveniles were observed moving downstream beginning in February and continuing throughout the year (Craig and Townsend 1946), and analysis of scales from adults returning to the McKenzie River in 1947 indicated that 13.5% (8/59) had entered the ocean as subyearlings (Mattson 1963). As described above, currently most UWR chinook salmon juveniles in the McKenzie subbasin migrate downstream soon after emergence as fry (age 0+), but some rear in the McKenzie River and then outmigrate as fingerlings (age 1+). Samples collected at various locations in the McKenzie River between 1948 and 1968 indicated that fry migrated from the system primarily during March through June. Fry migration past Leaburg Dam since 1980 has occurred primarily during January through April; thus, fry migration has occurred earlier than in previous years. Likewise, fingerling migration in the McKenzie River peaked in January through March during 1948 through 1968, and now peaks in October and November. This change in juvenile migration timing may be due to the release of warm water from the two USACE reservoirs above spawning areas during the fall incubation period, and the consequent acceleration of fry emergence (USACE 2000). The early emerging fry are now faced with a much longer period of unfavorable wintertime conditions (USACE 1995; NMFS and USFWS 2000).[10]

Rearing habitat is used by juvenile UWR chinook salmon for feeding and growth between emergence and entry into the estuary. Within the McKenzie subbasin, rearing habitat for juvenile UWR chinook salmon is provided by side channels and river margins along the mainstem and, to a lesser degree, tributaries such as the South Fork McKenzie River (WNF BRRD 1995; USACE 2000). The lower mainstem of the McKenzie River historically provided abundant UWR chinook salmon rearing habitat, especially in the lower, alluvial reaches where the river and floodplain were a complex mosaic of main channels, side channels, islands, sloughs, and wetlands (Fig. 5-5 above).

Much of the historical rearing habitat has been either lost or simplified during the 20th century as the function of the lower subbasin's floodplains has been impaired by peak flow reduction (due to dams), sediment supply reduction (due to trapping of gravel behind dams, streambank hardening by riprap and vegetation encroachment, and gravel mining), loss of LW, and transformation of many floodplain areas to fields, gravel mining quarries, roads, buildings, and other developments. The river is not only unable to create new floodplain complexity (e.g.,

[10]UWR chinook salmon eggs incubate in the gravel for one to four months, depending on water temperature. Chinook eggs require about 416 temperature units (TUs) to hatch (one TU = 1° C above freezing for one day), and an additional 472 TUs for fry to emerge from the gravel. However, the alteration of the water temperature regime in the McKenzie River, due to the existing operations of Cougar and Blue River dams, has accelerated the emergence timing of spring chinook fry by up to 85 days, most likely reducing fry survival (FERC 2001).

gravel bars, side channels, LW aggregations) during peak flows, but cannot maintain existing structural complexity. As islands, side channels, and LW are lost without being replaced, the structure of the entire stream channel simplifies and rearing habitat is consequently lost. The remaining rearing habitat is in some cases affected by deteriorating water quality and the presence of introduced predator species.

In summary, the importance of the upper McKenzie subbasin to UWR chinook salmon spawning and rearing increased throughout the 20th century as production in the lower subbasin, and in the other five subbasins, dramatically declined. The abundance and quality of spawning and rearing habitat, albeit underseeded, have declined, primarily due to the construction and operation of USACE's Blue River and Cougar dams. Winter flow releases from the dams are much smaller than historical flows at this time of the year due to flood control, and because reservoir filling for summertime recreation begins in February. Thus, side channels of the South Fork and the mainstem downstream of the South Fork confluence that historically provided rearing habitat for fry during the winter are not connected to the main channel (WNF BRRD1994). In the South Fork and the mainstem downstream of the South Fork confluence, the dams create warmer water temperatures during egg incubation in October and November, resulting in fry emergence as early as the first week in December into a longer period of unfavorable winter conditions.

5.3.4 Population Level Processes

NMFS estimates that the UWR chinook salmon population in the McKenzie River above Leaburg Dam must achieve an incremental increase in survival of 9 to 65% (depending on the relative effectiveness of hatchery fish spawning in the wild) to reduce the risk of extinction to an acceptable level (Table 4-3). An incremental increase in survival of >4 to >59% must occur for median population growth rate to increase to >1.0.

The threatened status of the population under the environmental baseline has been sensitive to adult conversion mortalities through sport fisheries in the lower Columbia and Willamette rivers (ODFW 2001). Average annual harvest rates on wild fish ranged from 27.3 to 41.1% (overall average = 32.8%) during 1980 through 1995 (total harvest - Clackamas River sport fishery from Table A-2 in ODFW 2001), a period that encompasses much of the baseline for NMFS' estimation of needed survival changes. However, fisheries can be directed at hatchery-origin fish if those fish can be differentiated externally from unmarked, natural-origin fish. As a term and condition of incidental take in NMFS' 2000 biological opinion on the USACE's and Bonneville Power Administration's (BPA) hatchery programs in the Upper Willamette basin (NMFS 2000b), the action agencies were directed to externally mark all hatchery-reared fish with an adipose fin clip. The expanded hatchery fish marking program was phased in beginning with the 1996 brood. As a result of this program, ODFW (2001) estimates that average annual adult harvest rates will be reduced from an average of 32.8% to less than 8%.[11] This will result in an incremental increase in survival of 37%:

$$\frac{Surv_{selective\ fishery}}{Surv_{environ.\ baseline}} = \frac{(1-0.08)}{(1-0.328)} = 1.37\ or\ 37\%$$

This estimate, 37%, is within the range needed to meet both NMFS' survival and recovery indicator criteria (Table 4-3). This means that, if hatchery-origin fish that spawned naturally during the base period were relatively unsuccessful compared to natural-origin spawners (hatch = 0.2), the McKenzie River population of UWR chinook is likely to at least stabilize over the next 48 years and is not likely to go extinct over the next 100 years. However, if hatchery-origin fish that spawned naturally during the base period were nearly as successful as natural-origin spawners (hatch = 0.8), it is unlikely that the population will survive or recover. As described in NMFS (2000b), information regarding the effectiveness of hatchery-origin spawners is sparse and insufficient to distinguish among these alternative assumptions.

Life history diversity is also an important measure of the health of the McKenzie subbasin population of UWR chinook salmon. The existence of multiple life histories in a single population allows salmon and other organisms to cope with the problem of survival in variable and fluctuating environments - the more diverse the life history strategies within a population, the more likely that the biological requirements of some portion of the population will be met in a changing environment. Life history diversity may be expressed during the freshwater phases of the life cycle as staggered timing and extensive longitudinal distribution of spawning, or as outmigration of juveniles at different ages. For example, the adults of a subpopulation may migrate farther and higher into headwater areas and spawn earlier than other members of the same population within a watershed or subbasin. Likewise, juveniles produced by the different subpopulations of this population may rear to different ages at different locations within a watershed or subbasin, and then outmigrate to the estuary at different times of the year (Lichatowich 2000).

Historically, UWR chinook salmon spawning in the McKenzie River started in early to mid-August and lasted as late as the third week of October. The spawning period, which has been reduced to about one third to one half of its historical length, is now largely confined to September. This change is reflected in the timing of egg collection in the McKenzie subbasin (Fig. 5-7). As described in Section 5.3, UWR chinook salmon spawning occurred more widely, historically, throughout the McKenzie subbasin than it does today. It is likely that spawning began during August in the upper subbasin and then gradually progressed downstream,

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[11] The actual impact of the freshwater fishery in 2001 was 8.27% for McKenzie River spring chinook salmon (ODFW 2002). This estimate was based on visual stock identification and coded-wire tag analyses.

concluding two to three months later in the lower reaches of the mainstem McKenzie River. However, there does not appear to be any historical information to substantiate this supposition (USACE 2000).

Mattson (1963) discusses the existence of a later-running spring chinook salmon that ascended the Willamette Falls in June at the end of the spawning migration. These fish were apparently much larger (25-30 lbs.; 11.4-13.6 kg) and older (presumably six year olds) than the earlier part of the run. Mattson (1963) speculated that this portion of the run “intermingled” with the earlier-run fish on the spawning ground and did not represent a distinct run. These large, later-running fish most likely spawned in the lower McKenzie River in considerable numbers. The disappearance of the June run in the upper Willamette Basin in the 1920s and 1930s was associated with the dramatic decline in water quality in the lower Willamette River.

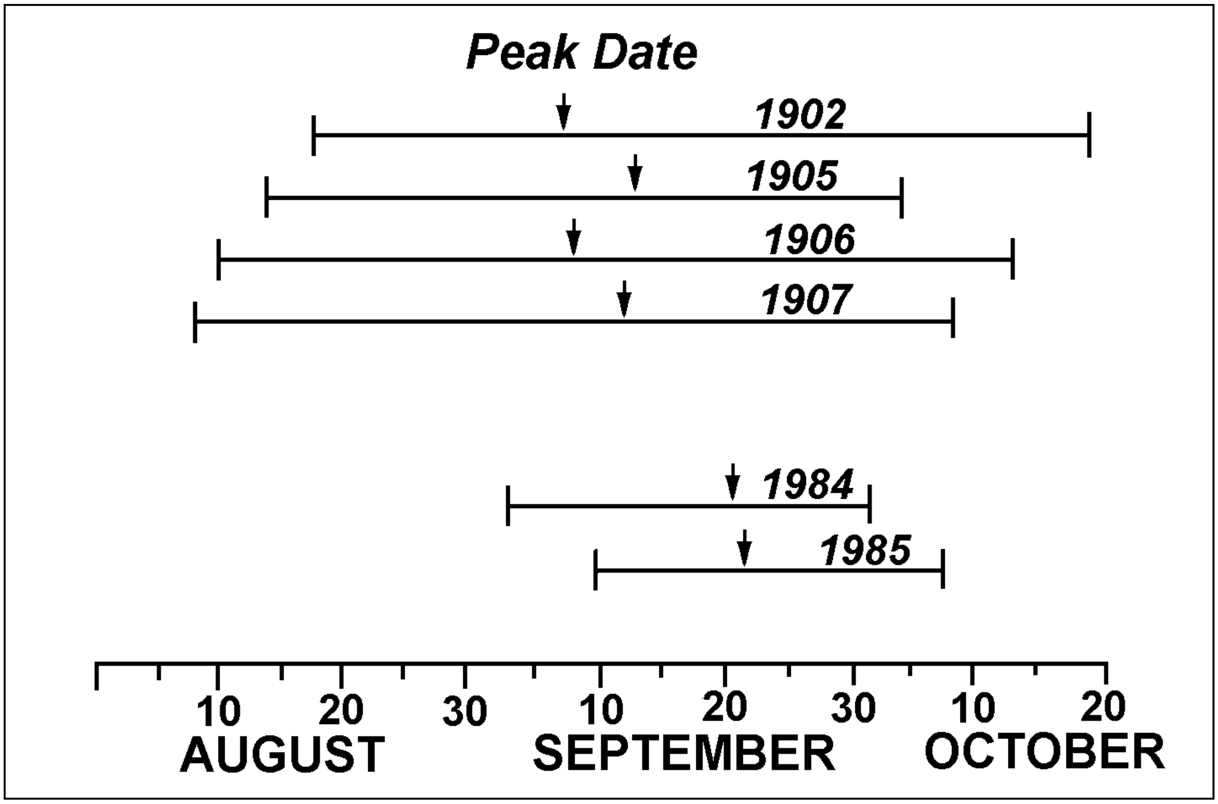

Figure 5-7. Comparison of historical and recent timing of egg takes from spring chinook in the McKenzie River (from Fig. 4-13 in USACE 2000).

Juvenile spring chinook salmon in relatively pristine systems demonstrate complex patterns of freshwater rearing and outmigration. Juveniles of the same population and age class may rear for different periods of time in different parts of the watershed/subbasin, and outmigrate at different ages. Spring chinook juveniles in the Willamette Basin generally followed this type of rearing and outmigration pattern, as shown by studies conducted in the l940s (Mattson 1962). Juvenile chinook salmon outmigrated through the lower Willamette River near Lake Oswego during three peak periods: 1) late winter/early spring (fry aged 0+, length 40-90 mm), 2) late fall/early winter (fingerlings age approximately 1, length 100-130 mm), and (3) a second spring peak (fingerlings 1+, length 100-140 mm; Mattson 1962). Less than half of a given age class emigrated at age 0+, less than half at age 1+, and less than a third at age 2. This study was conducted after the Willamette River had already been subjected to severe water pollution for several decades, thus the author suggested that juvenile UWR chinook salmon of various ages may have historically outmigrated down the Willamette River throughout the summer (Mattson 1962).

Little is known about the historical life history for juvenile UWR chinook salmon rearing in the McKenzie subbasin besides the sparse information mentioned above (Section 5.3). Changes in the timing of juvenile UWR chinook salmon outmigration since the construction of the USACE reservoirs have been observed, also described above in the rearing section. Historically, UWR chinook salmon spawning occurred over a 2- to 3-month period (compared to the current one month) throughout a greater proportion of the McKenzie subbasin than current spawning, especially in the lower mainstem McKenzie River. This extended and widespread spawning most likely facilitated diverse rearing strategies because fry would have been emerging at different times in different places in the winter and early spring, and abundant rearing habitat was available for these juveniles throughout the lower McKenzie River and upper mainstem of the Willamette River (see Fig. 5-5). It is probable that juvenile UWR chinook salmon rearing duration and outmigration timing was historically more diverse than it is now in the McKenzie subbasin, but there apparently is no information available to corroborate this (USACE 2000).

In summary, the spawning period, which has been reduced to about one-third to one-half of its historical length, is now largely confined to September. Some variation in emergence timing appears to have been lost and it is probable that the duration of the rearing period and outmigration timing were also more diverse than at the present time, although no data are available to corroborate the latter point.

5.3.5 Food Web Dynamics

Recent studies for the McKenzie River Watershed Council (Aquatic Biology Associates 2000) indicate good abundance and diversity within the action area for key aquatic insect families that serve as prey for chinook salmon and bull trout. However, the loss of historical habitats described above in Section 5.3, the introduction of exotic species, and the creation of new habitats in reservoirs and revetments could have caused shifts in the abundance and diversity of fishes that prey on listed salmon and bull trout in the McKenzie subbasin. Reservoirs, revetments, and other human-created structures provide extensive habitat for exotic and native predators of listed species. As well as preying on exotic animal and plant species, exotic fishes often compete with native species occupying similar ecological niches for food and habitat and/or modify, reduce, or eliminate habitat used by native species.

The McKenzie subbasin has been less affected by warmwater exotic fish species than other upper Willamette subbasins because of its high water quality and the absence of large reservoirs on the mainstem. However, warmwater exotic fish species such as largemouth bass, bluegill, and crappie are found in many of the subbasin's ponds, sloughs, and tributaries to the lower mainstem. Coldwater exotic fish species such as brown trout, lake trout, and brook trout are found in many of the streams and/or lakes in the upper subbasin. Cumulatively, these exotic species are capable of changing the dynamics of predation and competition affecting native species. USACE's Blue River and Cougar reservoirs provide deepwater habitat for several native predatory fish species that allow them to grow larger than otherwise expected. Water temperatures in Blue River reservoir are warm enough to support populations of warmwater exotic fishes. In comparison, water temperatures are generally too cold in Cougar reservoir for significant populations of exotic species to develop (USACE 2000). EWEB's Trail Bridge Reservoir supports large populations of exotic brook trout which, in addition to the threat of hybridization, potentially affect CR bull trout through competition and predation.

Exotic species probably prey on juvenile salmonids during their downstream migration. The operation of the Blue River and Cougar reservoirs has increased the susceptibility of these juveniles to predation during their outmigration because of decreased springtime water velocities compared to before these dams were built (see Fig. 5-4 and 5-5). Outmigrating juveniles generally move at rates that are a function of the local current velocity and reduced water velocities increase the travel time of downstream migrating fish, thus increasing exposure time to predation.

The construction of fish passage facilities at Willamette Falls and summer streamflow augmentation by the USACE dams has allowed and facilitated easier passage of non-native fall chinook, summer steelhead, and coho salmon into the McKenzie subbasin. These species may interbreed or compete directly with native species such as spring chinook salmon and bull trout. Hatchery production of salmon and trout in the McKenzie subbasin as mitigation for lost habitat above the USACE dams has likely adversely affected listed native species because the hatchery fish likely compete with native species for resources, and may also interbreed with them (USACE 2000).

5.4 Completed Consultations in the McKenzie River Subbasin Affecting the Environmental Baseline

<u>McKenzie Hydroproject</u>
On November 15, 1999, the Services completed a joint biological opinion for FERC on the

proposed licensing of the McKenzie Hydroelectric Project (FERC Project No. 11512), owned by Mr. John Bigelow. The Services concluded in the biological opinion that the proposed licensing was not likely to jeopardize the continued existence of listed CR bull trout or UWR chinook salmon. The issuance of a new license for the project will reduce adverse conditions for CR bull trout and UWR chinook salmon through installation of a protective screening and bypass system.

Cougar Reservoir Water Temperature Control
On March 8, 2000, the Services completed a joint biological opinion for USACE on the effects of constructing the proposed water temperature control project at Cougar Dam (Cougar WTC) on the South Fork McKenzie River on listed UWR chinook salmon, CR bull trout, and the northern spotted owl. Cougar Dam is part of USACE's Willamette Project. The purpose of the Cougar WTC Project is to retrofit the dam with a control tower that will give the USACE better control over the temperature of water releases from Cougar Dam. The construction of the water temperature control tower is scheduled for 2002 through 2004 with preliminary work beginning in 2001. The project is expected to benefit the two listed fish species in the project area (UWR chinook salmon and CR bull trout) by reducing effects on water temperature downstream in the South Fork and mainstem McKenzie rivers.

Willamette Basin Hatchery Program
On July 14, 2000, NMFS completed a biological opinion for USACE and BPA on the effects of collection, rearing, and release of salmonids associated with artificial propagation programs in the Willamette Basin on listed UWR chinook salmon and UWR steelhead (UWR steelhead do not occur in the McKenzie subbasin). USACE and BPA fund over 90% of the artificial propagation programs that potentially affect these two listed species as mitigation for loss of habitat for these species from the construction and operation of the Willamette Project. The hatcheries themselves are operated by the ODFW. The artificial propagation programs included in the July 14, 2000, biological opinion are located in the Clackamas, North Santiam, and McKenzie River subbasins. The biological opinion requires the USACE and BPA to implement measures to reduce interbreeding between hatchery-origin and natural-origin fish in areas where natural spawning occurs, to help develop more locally-adapted hatchery stocks, to reduce impacts to wild fish populations from hatchery broodstock collection, and to reduce harvest rates on natural-origin fish (by creating an opportunity for selective harvest through marking of all hatchery fish). The incremental survival improvement resulting from the selective fishery is discussed in Section 5.3.4.

Leaburg-Walterville Hydroelectric Projects
On September 6, 2001, the Services issued a biological opinion on the effects of FERC issuing a new license to EWEB for operation of the Leaburg-Walterville Hydroelectric Projects. The terms and conditions of the biological opinion were incorporated into the new license FERC issued on December 18, 2001. Articles in the new license and terms and conditions of the biological opinion require that EWEB make numerous modifications to the physical structure and operation of the Leaburg-Walterville Project that will have beneficial effects on UWR

chinook salmon. As license articles are implemented, FERC will ensure that EWEB takes all available measures at the Leaburg-Walterville Project to reduce the effects of the projects on factors that currently limit the productivity of the ESU:

- Direct passage mortality of chinook salmon smolts entrained into the Walterville Canal and powerhouse will be reduced to less than 0.5%
- Mortality of chinook salmon fry through the Leaburg fish screen facility when debris is on the screen or in the apex will be reduced to a consistent 2 to 4% by system modifications and revised maintenance procedures
- Attraction and delay of adult chinook in the tailrace of each project will be reduced or eliminated by the construction of tailrace barriers and delay will further be reduced by modifying the left bank fish ladder and redesigning and reconstructing the right bank fish ladder at Leaburg Dam to meet current design criteria
- Actions designed to increase the power generation capacity of the Leaburg and Walterville hydropower facilities (Leaburg lake raise and Walterville tailrace excavation) will be taken in a manner that does not increase direct or indirect effects on listed fish
- EWEB will maintain instantaneous minimum flows immediately downstream of Leaburg Dam and the Walterville intake at a continuous level of 1,000 cfs, maintaining current migration conditions for juvenile UWR chinook salmon
- Until the Walterville Canal is screened, EWEB will seasonally augment the minimum 1,000 cfs flow in the Walterville bypass reach to reduce the likelihood that migrating juvenile chinook salmon will be entrained into the Walterville Canal and powerhouse
- EWEB will operate the Leaburg-Walterville Project to meet a seasonal set of ramping rate criteria in the river below the Walterville tailrace and downstream from the Leaburg and Walterville diversions. Assuming that Walterville pond will be used in the future for power peaking (i.e., after the effects of fluctuating river levels in the McKenzie River downstream of the Walterville tailrace outfall are determined), EWEB operation of the pond will be governed by the ramping rate criteria included in the schedule
- EWEB will develop gravel and spawning and rearing habitat enhancement programs in a manner that implements the MWC's Conservation Strategy (currently under development)

5.5 Biological Requirements of UWR Chinook Salmon in Action Area

To some degree, each of the species considered in this biological opinion reside in or migrate through the action area. For UWR chinook salmon, NMFS has determined that the species obtains its biological requirements during these life history stages through access to essential features of critical habitat. Essential features include adequate 1) substrate (especially spawning gravel), 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) migration conditions (65 FR 773). The sections below list the essential features of critical habitat for UWR chinook salmon for each of the relevant habitat types within the action area.

5.6.1 Relevant Critical Habitat Types for Chinook Salmon in Action Area

5.6.1.1 Juvenile Rearing Areas

Essential features of critical habitat for juvenile chinook salmon rearing areas include adequate water quality, water quantity, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. The requirement for adequate substrate, although relevant to incubation of redds in the mainstem, is discussed under spawning areas, below.

5.6.1.2 Juvenile Migration Corridors

Essential features of critical habitat for juvenile chinook salmon migration corridors include adequate water quality, water quantity, water velocity, cover/shelter, food, riparian vegetation, space, and migration conditions.

5.6.1.3 Areas for Growth and Development to Adulthood

Essential features of critical habitat for juvenile chinook salmon areas for growth and development to adulthood include all the essential features of critical habitat for juvenile rearing areas (above).

5.6.1.4 Adult Migration Corridors

Essential features of critical habitat for adult chinook salmon migration corridors include all the essential features of critical habitat for juvenile migration corridors (above), although the threshold for adequate food may be lower than or different from that of juveniles in the migration corridor or of fish occupying areas for growth and development to adulthood.

5.6.1.5 Spawning Areas

Essential features of critical habitat for chinook salmon spawning areas include all the essential features of critical habitat for juvenile rearing areas (above), with the addition of adequate substrate and the exception of adequate food.

5.6.2 Adequacy of Habitat Conditions for UWR Chinook Salmon in Critical Habitat in Action Area

Regulations implementing Section 7(a)(2) of the ESA define "destruction or adverse modification" as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species." Adverse effects on a constituent element of critical habitat generally do not result in a determination of "adverse modification" unless that loss, when added to the environmental baseline, is likely to result in an appreciable decline in the value of the critical habitat for both the survival and the recovery of the listed species (50 CFR §402.02).

Quantitatively defining a level of adequacy through specific, measurable standards is difficult for many of these biological requirements. In many cases, the absolute relationship between the critical element and species survival is not clearly understood, thus limiting development of specific, measurable standards. Some parameters are generally well known in the fisheries literature (e.g., thermal tolerances). For other action-area biological requirements, the effects of any adverse impacts on essential features of critical habitat are considered in more qualitative terms.

5.7 Biological Requirements and the Current Baseline

Based on all the information above, not all of the habitat and biological requirements of UWR chinook in the action area are being met under the environmental baseline. The status of this species is such that there must be a significant improvement in the habitat and biological conditions they experience over those currently available under the environmental baseline to meet their biological requirements for survival and recovery.

6. ANALYSIS OF EFFECTS ON LISTED SPECIES AND CRITICAL HABITAT

The NMFS ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." Direct effects are immediate effects of the project on the species or its habitat, and indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur (50 CFR §402.02).

The proposed action addressed in this biological opinion is the issuance of a USACE 404 permit that allows construction (or modification) of fish ladders at Leaburg Dam. This biological opinion discusses the direct and indirect effects of these construction activities. The effects of the operation of the modified Leaburg Dam fish ladders have been addressed in a previous biological opinion (NMFS and USFWS 2001). NMFS determined that improvements made to the upstream passage facilities at Leaburg Dam will increase survival for upstream-migrating adult chinook salmon.

6.1 Effects of the Action

The primary adverse impacts on UWR chinook salmon and salmonid habitat likely to result from the proposed action include 1) mortality or injury of fish during dewatering of the area behind the right bank cofferdam, 2) an increase in suspended sediment and turbidity from the in-river construction work, 3) the possibility of chemical contaminants or hazardous material (gasoline, oil, grease, concrete) entering the river in the event of a spill, and 4) temporary loss of riparian habitat. EWEB's construction schedule (Appendix A) was created in collaboration with ODFW, NMFS, and USFWS. The schedule received written approval from ODFW on July 23, 2001, and received approval from the Services in their settlement agreement signed on September 7, 2001. The expected effects of each construction activity are addressed below.

6.1.1 Leaburg Right Bank Fish Ladder Construction

Construction at the right bank fish ladder involves several steps. Many of the construction activities will be carried out in the dewatered area behind the cofferdam.

6.1.1.1 Construction of a Cofferdam, Access Road, and Temporary Fish Return Bypass

The cofferdam will be constructed of riprap with plastic sheeting covering the side of the dam facing the river. A temporary access road will extend from the bank onto the top of the cofferdam. The temporary juvenile fish return bypass pipe will be constructed concurrently with the road, as the pipe will be installed beneath the road and discharge into the river downstream of the cofferdam. EWEB will also remove boulders and rocks to create a pool depth of at least 3 feet at the downstream end of the bypass outfall. Thus, the construction of the cofferdam and temporary fish bypass requires in-river work. This in-river work will occur between May 13, 2002, and June 11, 2002, within the work window developed and approved by the resource agencies to minimize impacts on salmonids and salmonid habitat (Appendix A).

Fish Salvage

After the cofferdam is complete, a fish salvage operation will be implemented to safely remove and relocate fish from behind the cofferdam. After receiving approval from ODFW on April 16, 2002, EWEB submitted a Fish Salvage Plan to FERC on April 17, 2002, in compliance with FERC license article 422. This plan was designed for the more extensive dewatering operation in the Walterville Canal, and did not contain specific details for fish salvage procedures behind the cofferdam at Leaburg Dam. However, the plan states that fish salvage behind the Leaburg cofferdam "will utilize and be consistent with the approaches and techniques developed as part of this fish salvage plan." The Fish Salvage Plan includes precautionary measures for handling ESA-listed fish as outlined in EWEB's Proposed Measure (a.)(ii.)(b.).

The placement of the large boulders for the riprap cofferdam and the fish salvage operation behind the cofferdam could result in direct lethal and non-lethal (i.e., injury) impacts on adult and juvenile UWR chinook salmon. The in-river construction of the cofferdam and implementation of the fish salvage operation will take place in May and June during the upstream migration, so adult chinook salmon could be present in the area being dewatered. During construction of the cofferdam, the right-side rollgates of Leaburg Dam will be closed. NMFS expects that adult salmon in the area will be attracted to the left side of the river by water being released from the left and middle rollgates, and will not hold on the right side of the river near the cofferdam construction. Although juvenile outmigration will not occur during the designated period, rearing juveniles are likely to be present in the project area and could also be directly affected by in-river work and the fish salvage operation. Fish salvage will be performed in accordance with EWEB's Proposed Measure (a.)(ii.)(2) and will utilize the techniques described in the ODFW-approved fish salvage plan. However, there is still the potential for some injury and mortality of adult and juvenile chinook salmon during the dewatering and fish salvage process. There is also a risk of direct mechanical injury of fish during cofferdam construction if fish encounter equipment during in-river work, but NMFS considers this risk to be low, as fish should avoid equipment in the water. EWEB estimates that approximately 50 juvenile fish and 3 adult fish are likely to be encountered during this phase of construction (pers. comm., Tim Downey, EWEB).

Water Quality

The placement of the large boulders for the riprap cofferdam and construction of the temporary juvenile bypass system will dislodge fine particles in the existing bed material of the river and increase suspended sediment levels (turbidity) in the river downstream of the construction site. This increase in turbidity and suspended sediment will result in temporary, minor negative effects on salmonid habitat and could result in direct injury or mortality to fish present in the project area.

The effects of suspended sediment and turbidity on fish are reported in the literature as ranging from beneficial to detrimental (see below). Elevated total suspended solids (TSS) conditions have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival. Elevated TSS conditions have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Of key importance in considering the detrimental effects of TSS on fish are the season, frequency, and duration of the exposure (not just the TSS concentration).

Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore et al. 1980; Birtwell et al. 1984; Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (McLeay et al. 1984, 1987; Sigler et al. 1984; Lloyd 1987; Scannell 1988; Servizi and Martens 1991). Juvenile salmonids tend to avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, except when the fish need to traverse these streams along migration routes (Lloyd et al. 1987). Gregory and Levings (1988) reported that tubidity also provides refuge and cover from piscivorous fish and birds. In systems with intense predation pressure, this benefit (e.g., enhanced survival) may balance the cost of detrimental physical effects (e.g., reduced growth). Turbidity levels of about 23 Nephalometric Turbidity Units (NTU) have been found to minimize predation risk (Gregory 1993).

Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding et al. 1987; Lloyd 1987; Servizi and Martens 1991).

At moderate levels, turbidity has the potential to adversely affect primary and secondary productivity, and at high levels, has the potential to injure and kill adult and juvenile fish. Turbidity might also interfere with feeding (Spence et al. 1996). Newly emerged salmonid fry may be vulnerable to even moderate amounts of turbidity (Bjornn and Reiser 1991). Other behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985). Fine redeposited sediments also have the potential to adversely affect primary and secondary productivity (Spence et al. 1996), and to reduce incubation success (Bell 1991) and cover for juvenile salmonids (Bjornn and Reiser 1991). Larger juvenile and adult salmon appear to be little affected by ephemeral high concentrations of suspended sediments that occur during most storms and episodes of snow melt. However, other research demonstrates that feeding and territorial behavior can be disrupted by short-term exposure to turbid water.

It is unlikely that suspended sediment will settle out directly at the project location due to turbulent water conditions immediately downstream of Leaburg Dam. However, suspended sediment has the potential to settle out on top of the existing bed material further downstream, possibly affecting the quality of spawning and rearing habitat. Fine suspended sediment typically settles out in areas of lowest velocity, such as pockets, backwaters and pools. Since chinook salmon spawn in water with velocities between 30 and 91 cm/second (Bjornn and Reiser 1991), it is unlikely that spawning areas will experience any significant sedimentation. A chinook salmon spawning area is located downstream of Leaburg Dam in a left bank side channel which has a slightly higher elevation than the main channel. Thus, it is unlikely that flow from the main channel will back up into the side channel. The several small channels and the outflow from Leaburg Hatchery that feed the side channel originate upstream on the left side of the river. The large cofferdam will be constructed on the right bank of the river, and most of the river flow in the main channel below Leaburg Dam follows the right bank of the river, opposite the upstream entrance to the side channel. Since turbid water from construction will likely remain on the side of the river opposite the origin of the spawning channel, and since it is unlikely that water from the main channel will back up into the downstream end of the spawning channel, it is unlikely that turbid water from the construction area will enter the side channel and impact the sensitive spawning area. However, if sedimentation does occur in this area, adults will probably dislodge the particles during construction of the redd. Due to the limited duration and magnitude of suspended sediment expected to be mobilized from the riverbed during construction of the cofferdam, and because fine sediments are not likely to settle in spawning areas, any downstream accumulations of fine sediment are expected to have only short-term effects on bed material composition.

In-river work will require machinery to operate in close proximity to the river, introducing a chance for toxic contaminants to enter the river. Pollutants can be introduced into waterbodies through direct contact with contaminated surfaces or by the introduction of storm or washwater runoff and can remain in solution in the water column or deposit on the existing bed material. Research has shown that exposure to contaminants reduces reproductive capacity, growth rates, and resistance to disease, and may lead to lower survival for salmon (Arkoosh 1998 a & b).

EWEB’s Proposed Measures include numerous measures for reducing the likelihood that suspended sediment or pollutants will enter the river. Implementation of a PECP is included as EWEB’s Proposed Measure (a.)(iv.). FERC license article 401 requires that EWEB submit a PECP, including a Spill Containment and Control Plan, prior to construction. The PECP was submitted to FERC on April 2, 2002, and received NMFS approval by letter dated March 22, 2002. The PECP contains all of EWEB’s Proposed Measures that were submitted as part of the proposed action for this consultation. Specific measures for reducing the impacts of turbidity and pollutants are included in the following Proposed Measures: (a.)(vi.) Treated Wood Removal, (b.) Pre-construction Activities, (c.) Heavy Equipment, and (d.) Site Preparation. The likelihood that contaminants will enter waterways will be minimized by implementation and enforcement of the PECP.

In summary, there is some risk of direct injury and mortality associated with turbidity and chemical pollutants from construction of the cofferdam, access road, and temporary bypass. However, these impacts should not significantly affect long-term habitat processes or population levels, because the turbidity should be localized, brief, and timed to occur within a period that minimizes effects on UWR chinook salmon. In addition, neither turbidity nor pollutant levels are expected to impair currently properly functioning habitat or retard the long-term progress of impaired habitats towards recovery.

Riparian Vegetation and Floodplain Function

The construction of the cofferdam, access road, and temporary fish bypass system will destroy some riparian vegetation. On the right bank, a small wetland consisting of young Sitka willow (*Salix sitchensis*) and red-osier dogwood (*Cornus sericea*) will be covered during construction of the temporary access road and cofferdam. Riparian habitats are one of the most ecologically productive and diverse terrestrial environments (Kondolf et al. 1996; Naiman et al. 1993). Vegetation in riparian areas influences channel processes by stabilizing bank lines through root reinforcement, and providing large woody material, providing organic material inputs (e.g., leaf litter) that serve as energy sources for stream organisms; and acting as a source of terrestrial organisms that "fall" into the water and are preyed upon by fish rather than autochthonous food production, and providing shade that regulates light and temperature regimes (Kondolf et al. 1996; Naiman et al. 1993). In addition, riparian vegetation and LW can provide low velocity shelter habitat for fish during periods of flooding, while instream LW provides similar habitat at all flow levels, as well as shelter from predators, habitat for prey species, and the sediment storage and channel stability attributes described above (Spence et al. 1996). For this project, any instream large wood or riparian vegetation that is moved or altered by construction activities will stay onsite or be replaced with a functional equivalent in accordance with EWEB's Proposed Measure (d.) Site Preparation. If any trees are removed, then removal EWEB will mitigate onsite by a 2:1 replanting ratio in accordance with EWEB's Proposed Measure (d.)(iii.). The contractor will also recontour and replant the affected area with native woody and herbaceous riparian vegetation after completion of construction in accordance with EWEB's Proposed Measure (f.) Site Restoration. Success of the replanting effort will be assured by implementation and enforcement of EWEB Proposed Measure (f.)(ix.) regarding planting success.

Thus, although there will be negative effects on riparian vegetation by construction of the cofferdam, access road, and temporary fish bypass, these effects will be short term, as EWEB will replant all disturbed areas with native woody and herbaceous vegetation at the conclusion of construction. The new vegetation will provide functional habitat for salmonids, and these functions will evolve as the vegetation matures, providing a source of large wood for the riverine ecosystem in approximately 15 years.

6.1.1.2 Construction and Use of Contractor's Right Bank Staging Area

After the area behind the cofferdam has been dewatered, the contractor will construct a staging area between the cofferdam and Leaburg Canal, within 50 feet of the McKenzie River. Physical site constraints prevent siting the staging area farther away to meet the 150-foot setback requirement in NMFS'15 Categories Programmatic Opinion. Due to the proximity of the site to the river, EWEB will ensure the contractor is effectively implementing and enforcing the PECP (Section 6.1.1.1 and Section 3.3.2), minimizing the likelihood of point-source pollution of the river and ensuring prompt clean-up of any spills that occur.

The dewatered area behind the cofferdam will require periodic pumping to remain dry. Sediment-laden or contaminated water pumped from behind the work area will be discharged into an upland area providing over-ground flow prior to returning water to the canal, river, or a desilting basin in accordance with EWEB's Proposed Measure (a.)(ii.)(c). All wash and rinse water resulting from cleaning machinery will be treated prior to discharge into the river in accordance with EWEB's Proposed Measure (c.)(ii.). Thus, NMFS expects the negative effects resulting from construction of the contractor's staging area to be brief and minor.

6.1.1.3 Demolition of the Existing Right Bank Fish Ladder

Demolition of the existing right bank fish ladder will occur in the dewatered area behind the cofferdam, so the likelihood of direct construction impacts on UWR chinook salmon and salmonid habitat is low. However, due to the proximity of construction equipment to the river, risks of pollutant introduction exist for this action, as discussed in Section 6.1.1.2. Implementation of EWEB's PECP will minimize the likelihood of water-quality contamination effects. Additionally, material excavated during removal will be placed in areas where it cannot enter streams in accordance with EWEB's Proposed Measure (e.) regarding earthwork.

6.1.1.4 Construction of a New Vertical Slot Fishway

Construction of the new vertical slot fishway will occur within the area dewatered behind the cofferdam, so there is a low likelihood of negative impacts on UWR chinook salmon and salmonid habitat. However, due to the proximity of construction equipment to the river, risks of pollutant introduction exist for this action, as discussed in Section 6.1.1.2. Implementation of the EWEB's Proposed Measures will minimize the severity of any short-term effects, and will greatly reduce the likelihood of long-term effects.

6.1.1.5 Modification of the Existing Bypass Outfall

Modification of the existing bypass outfall will occur within the area dewatered behind the cofferdam, so there is a low likelihood of negative impacts on UWR chinook salmon and salmonid habitat. However, due to the proximity of construction equipment to the river, risks of pollutant introduction exist for this action, as discussed in Section 6.1.1.2. Implementation of the EWEB's Proposed Measures will minimize the severity of any short-term effects, and will greatly reduce the likelihood of long-term effects.

6.1.1.6 Removal of the Cofferdam and Temporary Bypass

The cofferdam and temporary fish bypass will be removed within a one-week work window (between October 31 and November 6, 2002), which was developed and approved by ODFW and NMFS specifically for this project (Appendix A). Removal of the cofferdam and temporary bypass will cause an increase in suspended sediment in the McKenzie River for up to one week, which will affect salmonids and salmonid habitat as discussed in Section 6.1.1.1. The increase in turbidity will occur after the majority of spawning has occurred, but during incubation. Sediment dislodged during removal of the cofferdam will likely remain in suspension in the turbulent Leaburg Dam tailrace. However, fine sediment could settle out and affect aeration of incubating eggs downstream of the construction site. Associated risks of introducing pollutants into the river from construction machinery are discussed in 6.1.1.2. In addition, yearling juvenile chinook salmon will be outmigrating past Leaburg Dam while the temporary bypass is removed. The contractor will disconnect the temporary bypass and reconnect the existing bypass within a 48-hour period. EWEB will shut off the turbines, close the canal headgates, and close the bypass flume gate to shut off flow in the bypass flume. Thus, EWEB will maintain the water level in the canal at a fairly high level, creating a pool up to the canal headgates. There will not be any flow through the screens, and fish will hold in the deep pool between the screen and the headgates until the bypass flume is reopened. Any juveniles that are trapped in the pool will experience up to a two-day delay in migration, and could be subject to predation. However, this approach prevents dewatering and fish salvage within the screen area, which would likely have more detrimental effects on downstream migrants. There are low risks for negative long-term effects resulting from this activity, and implementation of the appropriate Proposed Measures will minimize the severity of short-term effects.

6.1.2 Left Bank Ladder Modifications

Construction at the left bank fish ladder will occur in several steps. The majority of the construction will be performed on land with erosion control measures in effect.

6.1.2.1 Construction and Use of Left Bank Contractor's Staging Area

The contractor will construct a staging area in the existing parking lot adjacent to Leaburg Lake at a minimum of 50 feet from the McKenzie River. The necessity to maintain traffic flow through the parking lot to the Leaburg Fish Hatchery prevented siting the staging area farther away. The proximity of the site to the river will require extra vigilance by EWEB to ensure the contractor is effectively implementing and enforcing the PECP (Section 6.1.1.1 and Section 3.3.2), minimizing the likelihood of point-source pollution of the river, and ensuring prompt clean-up of any spills that occur.

6.1.2.2 Placement of a Fabricated Bulkhead at the Fish Ladder Entrance

A fabricated steel bulkhead will be attached to the downstream end of the fish ladder so that modifications to the entrance can be made in the dry. Alternatively, the contractor may install a cofferdam to completely dewater the downstream end of the ladder. Installation of the bulkhead (or cofferdam, if applicable) will involve in-water work that will be performed between July 1 and August 15, 2003, which is the preferred ODFW in-water work window for the McKenzie River (Appendix A). Both activities would likely cause temporary elevated turbidity levels in the river, as discussed in Section 6.1.1.1. In addition, heavy machinery will be operated in close proximity to the river to install the bulkhead or cofferdam. Erosion control measures outlined in EWEB's Proposed Measures will prevent discharge of sediment resulting from work on the river bank into the McKenzie River. Implementation and enforcement of EWEB's PECP will minimize the likelihood of point-source pollution entering the river, ensure prompt clean-up of any spills that occur, and greatly reduce the likelihood of long-term effects.

6.1.2.3 Modification of the Ladder Structure

The existing left bank ladder entrance gate is not adjustable, resulting in head differentials at the fishway entrance that vary from nearly zero at high river flows to about four feet at low river flows. A new telescoping weir gate will be placed at the entrance to the fish ladder to allow for adjustment of the hydraulic conditions in the ladder to meet NMFS' passage criteria. Placement of the new entrance gate will occur in the dry behind the fabricated bulkhead or cofferdam. EWEB will also modify the existing left bank fish ladder by extending the height of the ladder walls, which will consist of concrete form work and concrete pouring. The potential for wet concrete to accidentally fall into the river or draining into streams increases when activities are adjacent to water bodies. Wet concrete alters the pH of the water, creating an acutely toxic situation for fish (NMFS 2001). Implementation and enforcement of EWEB's Proposed Measures and PECP will minimize the chances of wet concrete entering the river, and will ensure that appropriate measures are taken in the case of a spill. In-river work will occur during the ODFW-approved in-water work window between July 1, 2003, and August 15, 2003 (Appendix A). It is likely that fish will avoid the immediate project vicinity during construction, so the chance of direct injury from equipment is low. All machinery used for the concrete work will be stored and cleaned in the contractor's staging area at least 50 feet from the river's edge. Thus, implementation and enforcement of EWEB's Proposed Measures will greatly reduce the likelihood of long-term effects.

6.2 Passage Conditions During Construction

Currently, the right bank ladder at Leaburg Dam is not operational, and the left bank ladder is operating, but passage conditions are not optimal (NMFS and USFWS 2001). The modifications being made to the left bank ladder and the reconstruction of the right bank ladder will greatly enhance the long-term passage conditions for upstream migration of chinook salmon. Spring chinook salmon begin entering the McKenzie system as early as mid-April, and typically pass through the project area beginning in late April. The migration continues for several months, and spawning begins as early as August. The new right bank fish ladder will be constructed between May and November 2002, during which the existing left bank ladder will be operational. This allows migrating chinook salmon during the 2002 migration season to pass upstream using the left bank ladder until completion of the new right bank ladder in November. In 2003, the left bank ladder will be periodically closed for construction of improvements, but the new right bank ladder will be open.

Downstream-migrating fry pass through the project primarily between January and April, while the fingerling migration occurs primarily during October and November. Downstream passage through the existing fish bypass will cease when the temporary fish bypass system is installed. In an email dated March 26, 2002, NMFS approved the design of the temporary fish bypass system and agreed that it would be operated in the following manner.

At minimum bypass flow of 60 cfs, flow from the temporary bypass will be conveyed straight through the 6-foot by 4-foot steel insert box into the 42-inch diameter steel pipe. Flow will not be conveyed through the second 42-inch diameter steel which is connected to the side, by a sweeping bend, of the steel insert box during normal operation. This will enhance passage conditions through the system, as the full 60 cfs will provide increased depth (of approximately 1.3 feet) and will eliminate passage of fish and debris through the pipe bend. Passage through the pipe bend is undesirable, as the pipe is likely to become occluded with debris, resulting in injury to fish. Minor adjustments to the bypass might be required after the system has been evaluated. NMFS will inspect the hydraulic conditions in the temporary system for excessive turbulence or shallow depth.[12] Upon NMFS' inspection of flow conditions in the box, placement of an orifice plate may be required to increase depth inside the box to minimize the chance of fish impacting the invert of the steel box as they drop from the flume.

[12] Agreed upon by NMFS, EWEB, and MWH in an email dated March 26, 2002.

When construction on the right bank is complete, diversion of flow through the fish screens will cease when EWEB closes the canal headgates and shuts off the turbines as described in Section 6.1.1.6. Fish trapped in the pool between the fish screen and the headgates will experience up to a two-day migration delay before flow through the existing bypass is restored. Juveniles may also pass downstream through the adult fish ladders. Although there is not site-specific data regarding downstream survival of juveniles through the adult fish ladders, there is a possibility for negative interactions in the fish ladders between adults and juveniles (NMFS and USFWS 2001). However, the likelihood of juvenile fish being entrained into the adult ladders and suffering harm is very low (NMFS and USFWS 2001). Thus, downstream-migrating juveniles will be afforded safe downstream passage throughout the entire construction process.

6.3 Effects on Critical Habitat

Critical habitat for UWR chinook salmon was designated on February 16, 2000 (65 FR 7764). Within the McKenzie subbasin, critical habitat includes all accessible areas except those above Tamolitch Falls and Blue River Dam. The effects of the proposed action on the essential features of designated critical habitat are summarized below.

The 10 essential features of UWR chinook salmon critical habitat are 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions. The construction activities at the Leaburg fish ladders is likely to have temporary adverse effects on several aspects of critical habitat. However, it is expected that due to implementation of EWEB's Proposed Measures and the ODFW-approved construction schedule, the negative effects will be brief in nature, and are not expected to impair currently properly-functioning habitat or appreciably reduce the functioning of already impaired habitats. The underlying ecological design approach to construction and resulting beneficial passage improvements will contribute to natural habitat-forming processes and ultimately improve conditions for adult and juvenile UWR chinook salmon in the project area.

Table 6-1. Summary of effects of the proposed action on essential features of UWR chinook salmon critical habitat.

UWR Essential Habitat Feature	*Summary of Effects*
Substrate	No long-term adverse effects on biological requirements for spawning gravel (size or distribution) are expected under the proposed action.
Water quality	Although short-term impacts to water quality (increased suspended sediment) are expected, the proposed action does not include measures that would be likely to adversely affect water quality.
Water quantity	The proposed action does not include measures that will adversely affect biological requirements for water quantity.
Water velocity	The proposed action does not include measures that will adversely affect biological requirements for water velocity.
Cover/shelter	The proposed action does not include measures that will adversely affect biological requirements for cover or shelter.
Food	Although short-term increases in suspended sediment might interfere with primary production and feeding behavior, the proposed action does not include measures that are likely to adversely affect long-term biological requirements for food.
Riparian vegetation	Although riparian vegetation will be removed during construction, it will be replanted. Thus, the proposed action does not include measures that will adversely affect long-term riparian vegetation function.
Space	The proposed action does not include measures that will adversely affect biological requirements for space.
Safe passage conditions	The proposed action does not include measures that will adversely affect safe passage conditions.

6.4 Effects of Interrelated and Interdependent Activities

Effects of the proposed action include the effects of other activities that are interrelated to, or interdependent with, that action. Interrelated and interdependent activities are those that would not be undertaken by the action agency but for the proposed action. NMFS is not aware of any interrelated and interdependent activities associated with the proposed action.

7. CUMULATIVE EFFECTS

Cumulative effects, as defined in 50 CFR §402.02, include the effects of future state, tribal, local, or private actions, not involving Federal activities, that are reasonably certain to occur within the action area (described in Section 1). Future Federal actions requiring separate consultations pursuant to Section 7 of the ESA are not considered here.

State, tribal, and local government actions are likely to be in the form of legislation, administrative rules, or policy initiatives. Government and private actions may include changes in land and water use patterns, including ownership and intensity, any of which could affect listed species or their habitat. Even actions that are already authorized are subject to political, legislative, and fiscal uncertainties. These realities, added to the geographic scope of the action area, which encompasses numerous government entities exercising various authorities and many private landholdings, make any analysis of cumulative effects difficult and even speculative. This section identifies representative actions that, based on currently available information, are reasonably certain to occur. NMFS also identifies goals, objectives and proposed plans by state and Tribal governments. However, NMFS is unable to determine at this point in time whether such proposals will in fact result in specific actions.

7.1 State Actions

Most future actions by the state of Oregon are described in the Oregon Plan for Salmon and Watershed measures, which includes the following programs designed to benefit salmon and watershed health:

- Oregon Department of Agriculture water quality management plans
- Oregon Department of Environmental Quality development of total maximum daily loads (TMDLs) in targeted basins; implementation of water quality standards
- Oregon Watershed Enhancement Board funding programs for watershed enhancement programs, and land and water acquisitions
- ODFW and Oregon Water Resources Department (OWRD) programs to enhance flow restoration
- OWRD programs to diminish overappropriation of water sources
- ODFW and Oregon Department of Transportation programs to improve fish passage; culvert improvements/replacements
- Oregon Department of Forestry state forest habitat improvement policies and the Board of Forestry pending rules addressing forestry effects on water quality and riparian areas
- Oregon Division of State Lands and Oregon Parks Department programs to improve habitat health on state-owned lands
- Department of Geology and Mineral Industries program to reduce sediment runoff from mine sites

- State agencies funding local and private habitat initiatives; technical assistance for establishing riparian corridors; and TMDLs

If the foregoing programs are implemented, they may improve habitat features considered important for the listed species. In November 2000, however, Oregon voters approved a broad constitutional amendment requiring payment to private property owners for diminution in property values resulting from regulations. That measure essentially puts all Oregon regulatory initiatives into question. The Oregon Plan also identifies private and public cooperative programs for improving the environment for listed species. The success and effects of such programs will depend on the continued interest and cooperation of the parties. One such cooperative program, the Willamette Restoration Initiative (WRI), has been charged with developing the Willamette basin section of the Oregon Plan. The future of the WRI will be subject to discussion among the WRI board, the Oregon Governor's office, and the Oregon legislature in the 2001 legislative session.

In the past, Oregon's economy has depended on natural resources, with intense resource extraction. Changes in the state's economy have occurred in the last decade and are likely to continue, with less large-scale resource extraction, more targeted extraction, and significant growth in other economic sectors. Growth in new businesses, primarily in the technology sector, is creating urbanization pressures and increased demands for buildable land, electricity, water supplies, waste-disposal sites, and other infrastructure.

Economic diversification has contributed to population growth and movement in the Willamette Valley, a trend likely to continue for the next few decades. Such population trends will result in greater overall and localized demands for electricity, water, and buildable land in the action area; will affect water quality directly and indirectly; and will increase the need for transportation, communication, and other infrastructure. The impacts associated with these economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the listed species. The overall effect will be negative, unless carefully planned for and mitigated.

Some of the state programs described above are designed to address these impacts. Oregon also has a statewide, land-use-planning program that sets goals for growth management and natural resource protection. If the programs continue, they may help lessen the potential for the adverse effects discussed above.

7.2 Local Actions

Local governments will be faced with similar and more direct pressures from population growth and movement. There will be demands for intensified development in rural areas, as well as increased demands for water, municipal infrastructure, and other resources. The reaction of local governments to growth and population pressure is difficult to assess without certainty in policy and funding. In the past, local governments in Oregon generally accommodated growth in ways that adversely affected listed fish habitat. Because there is little consistency among local governments regarding current ways of dealing with land use and environmental issues, both positive and negative effects on listed species and their habitat are probably scattered throughout the action area.

Local governments in Oregon are considering ordinances to address effects on aquatic and fish habitat from different land uses. The programs are part of state planning structures; however, local governments are likely to be cautious about implementing new programs, because of the passage of the constitutional amendment discussed above. Some local government programs, if submitted, may qualify for a limit under NMFS' 4(d) rule, which is designed to conserve listed species. Local governments may also participate in regional watershed health programs, although political will and funding will determine participation and, therefore, the effect of such actions on listed species. Overall, unless beneficial programs are comprehensive, cohesive, and sustained in their application, it is not likely that local actions will have measurable positive effects on listed species and their habitat and may even contribute to further degradation.

7.3 Tribal Actions

Tribal governments will participate in cooperative efforts involving watershed and basin planning designed to improve aquatic and fish habitat. The results of changes in tribal forest and agricultural practices, in water resource allocation, and in land use are difficult to assess, for the reasons discussed in sections 7.1 and 7.2. The earlier discussion of the effects of economic diversification and growth applies also to tribal government actions. The tribal governments have to apply and sustain comprehensive and beneficial natural resource programs such as the ones described below, to areas under their jurisdiction to have measurable positive effects on listed species and their habitat.

The Services know of no ongoing tribal fisheries restoration project in the McKenzie River basin.

7.4 Private Actions

The effects of private actions are the most uncertain. Private landowners may convert their lands from current uses, or they may intensify or diminish those uses. Individual landowners may voluntarily initiate actions to improve environmental conditions, or they may abandon or resist any improvement efforts. Their actions may be compelled by new laws, or they may result from growth and economic pressures. Changes in ownership patterns will have unknown impacts. Whether any of these private actions will occur is highly unpredictable, and the effects are even more so.

7.5 Summary

Non-Federal actions are likely to continue affecting listed species. The cumulative effects in the action area are difficult to analyze, considering the broad geographic landscape covered by this opinion, the geographic and political variation in the action area, the uncertainties associated with government and private actions, and ongoing changes to the region's economy. Whether those effects will increase or decrease in the future is a matter of speculation; however, based on the population and growth trends identified in this section, cumulative effects are likely to increase. Although state, tribal, and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive manner before the Services can consider them "reasonably foreseeable" in the analysis of cumulative effects.

8. CONCLUSIONS

In this opinion, NMFS must determine whether the action is likely to jeopardize UWR chinook salmon, as well as whether the action is likely to destroy or adversely modify the species' designated critical habitat. As noted in Chapter 1, the analyses of jeopardy/destruction or adverse modification of critical habitat leading to these conclusions involves the following steps: 1) define the biological requirements and current range-wide status of the listed species (Chapter 4); 2) describe the status of the environmental baseline within the action area (Chapter 5); 3) evaluate the effects of the proposed action on the listed species (Chapter 6); and 4) consider the cumulative effects on the listed species (Chapter 7).

This opinion concludes that the effects of the proposed action, together with the environmental baseline and cumulative effects, is not likely to jeopardize the continued existence of UWR chinook salmon or result in the destruction or adverse modification of its designated critical habitat. Although the available information includes quantitative estimates of the risk of extinction under the environmental baseline, it is largely qualitative, based on the best available scientific and commercial data. Despite an increasing trend toward a more quantitative understanding of the critical life signs for these fish, critical uncertainties limit NMFS' ability to project future conditions and effects. As a result, no hard and fast numerical indices are available on which NMFS can base determinations about jeopardy or the adverse modification of critical habitat (i.e., the Section 7(a)(2) standards). Therefore, NMFS' conclusions are qualitative judgements based on the best quantitative and qualitative information available.

As discussed in Section 4.1.1, historically, five major subbasins in the upper Willamette system produced spring chinook salmon: the Clackamas, North and South Santiam, Middle Fork Willamette, and McKenzie rivers. Between 1952 and 1968, dams were built on all of the major tributaries occupied by spring chinook salmon, blocking over half of the most productive spawning and rearing habitat. Water management operations have reduced the quality of the remaining spawning and rearing habitat in downstream areas. In particular, the release of relatively warm water during autumn leads to the early emergence of stream-type chinook salmon fry and relatively cold water released during summer may delay adult migrants. Mitigation hatcheries, built to offset the substantial habitat losses resulting from dam construction, maintained broodlines that are relatively free of genetic influences from outside the basin but may have homogenized within-basin stocks, simplifying the population structure of the ESU. The number of naturally-spawning fish has increased gradually in recent years but NMFS believes that many are first-generation hatchery fish.

At this time, chinook salmon in the McKenzie River above Leaburg Dam constitute the largest remaining spawning aggregation of wild fish in the Upper Willamette River ESU (approximately 40% of the ESU's production potential). Within the action area, the environmental baseline continues to limit the productivity of the population in the following ways:

- Storage and release operations at the USACE's Cougar and Blue River dams have reduced the frequency and magnitude of flood events, which has created a relatively static and simplified aquatic habitat compared to conditions under which UWR chinook salmon evolved
- Storage and release operations at the USACE's Cougar and Blue River dams have altered the annual hydrograph, reducing peak flows in the winter and spring and by increasing low flows in the summer and fall
- Construction of the USACE's Cougar and Blue River dams trapped both sediment and large woody debris in the upper subbasin, reducing transport to spawning habitat in the Leaburg and Walterville reaches
- Large wood was directly removed from stream channels of all sizes in a misdirected effort to improve fish passage, for timber salvage, to reduce downstream damage to bridges during floods, and to prevent navigation hazards
- Much of the riparian vegetation was removed for farmland, residences, timber harvest, and roads, reducing the acreage covered and functional value of the riparian zone
- Altered flow regime and the construction of flood control structures (levees and revetments) affected channel morphology: the creation of new bars and islands, bank erosion, channel width and meandering, and the migration of channel bars.

Under the terms of its reinstated FERC license, dated April 27, 2000, EWEB will greatly reduce the direct and indirect effects of its Leaburg and Walterville hydro projects as discussed in NMFS and USFWS (2001). In addition, NMFS' July 14, 2000, biological opinion on the USACE's Willamette basin hatchery mitigation program requires that all hatchery-reared spring chinook salmon be adipose-fin clipped before release, facilitating a selective fishery. NMFS estimates that implementation of the selective fishery, plus the measures at Leaburg and Walterville required by the FERC license (described in NMFS and USFWS 2001), will result in an incremental survival improvement for juvenile chinook salmon of at least 45%, within the range needed to meet NMFS' survival and recovery criteria.

By implementing the proposed action, USACE will be ensuring that EWEB takes all available measures at the Leaburg fish ladder construction site to reduce the effects of factors that could limit the productivity of the ESU:

- Any in-water work will be completed within the ODFW-approved in-water work period developed specifically for this project
- Most in-water work areas will be isolated from the stream with a coffer dam, so the opportunities for direct harm of fish from machinery is minimized.
- Dewatering procedures will be conducted pursuant to EWEB's Proposed Measure (a.)(2.)(b.) and the techniques outlined in EWEB's ODFW-approved Fish Salvage Plan submitted as license article 422.
- Implementation and enforcement of EWEB's Pollution and Erosion Control Plan (and erosion and sediment control practices described in EWEB's Proposed Measures) will

minimize the likelihood of increased sediment loads and chemical contaminants entering the McKenzie River.

- All stream banks and riparian vegetation that were disrupted during construction will be successfully replanted with native woody and herbaceous riparian vegetation, ensuring the restoration of proper riparian and floodplain processes

In recognition of the risk posed by siting the contractor's right- and left-bank staging areas within 50 feet of the river, the proposed action includes an environmental compliance oversight and enforcement component to ensure the PECP is implemented effectively .

Until a species-specific recovery plan is developed, the Basinwide Strategy (see Section 1. 3) provides the Services with guidance for judging the significance of FERC's proposed action relative to the species-level biological requirements of UWR chinook salmon. By issuing the 404 permit for the reconstruction of fish ladders at the Leaburg Project, requiring EWEB to implement the measures described in the proposed action (Chapter 3 of this biological opinion), USACE will meet its responsibilities with respect to construction at the Leaburg Project under the Basinwide Strategy. NMFS has determined that the proposed action will avoid jeopardy by maintaining a population trajectory within the range needed for survival and recovery. Further, NMFS finds that the proposed action will not adversely modify or destroy designated critical habitat for UWR chinook salmon.

This consultation addresses a construction project that could affect the survival of UWR chinook salmon migrating to and from the remaining spawning and rearing habitat in the McKenzie River subbasin. Much of the historical spawning habitat in this important subbasin is currently blocked by other projects – EWEB's Carmen-Smith and the USACE's Cougar and Blue River dams. Subsequent consultations with FERC and with the USACE will address the need for access to this spawning habitat to achieve the distribution and diversity this ESU requires to survive and recover.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by regulation as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

An incidental take statement specifies the amount or extent of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

The measures described below are non-discretionary, and must be undertaken by USACE and EWEB and made binding conditions of any license or contract issued in the course of implementation of any component of the proposed action for the exemption in Section 7(o)(2) to apply. The USACE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACE: 1) fails to assume and implement the terms and conditions; or 2) fails to require EWEB to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the contracts, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USACE must report the progress of the action and its impact on the species to the Services as specified in the incidental take statement (50 CFR §402.14(i)(3)).

9.1 Amount or Extent of Take

NMFS anticipates that the proposed action is reasonably certain to result in incidental take of UWR chinook salmon because of the detrimental effects from the capture and release of fish necessary to isolate the in-water work area (non-lethal and lethal), increased sediment and possible pollutant levels (non-lethal), and riparian habitat disruption (non-lethal).

Effects of actions such as minor sedimentation and minor riparian disturbance are unquantifiable in the short term and are not expected to be measurable as long-term harm to habitat features or as long-term harm to salmonid behavior or population levels. Therefore, even though NMFS expects some low level of incidental take to occur due to the construction actions (other than during the dewatering process), the best available scientific and commercial data are not sufficient to enable NMFS to estimate the specific amount of incidental take to the species itself. In instances such as these, NMFS designates the expected level of take due to sedimentation as "unquantifiable."

Effects of isolating the work area from the flowing waters of the McKenzie River could result in minor incidental lethal take of UWR chinook. Based on site-specific habitat and flow conditions, EWEB estimates the possibility of take (in the form of capture and release) of up to 50 juveniles and 3 adults (pers. comm., Tim Downey, EWEB). Lethal take should be less than 5% (approximately 5 juveniles and 1 adult) due to implementation of handling procedures as outlined in EWEB's Proposed Measures (a.)(2.)(b.). The extent of take is limited to UWR chinook salmon in the McKenzie River.

9.2 Reasonable and Prudent Measures

NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of UWR chinook salmon from the actions covered in this opinion. The USACE shall include permit provisions to ensure that EWEB shall:

1. Minimize the likelihood of incidental take from in-river work by operating within the ODFW-approved in-water work periods developed specifically for this project and ensuring safe passage conditions during construction.

2. Minimize the likelihood of take from fish salvage during dewatering by implementing practices outlined in the approved fish salvage plan developed for FERC license article 422, which includes NMFS guidelines to avoid or minimize fish injury and mortality.

3. Minimize the likelihood of incidental take and alteration of critical habitat by ensuring that construction practices are designed to limit the affected area to the minimum necessary to complete the project, by implementing responsible construction techniques, and by fully revegetating with native species.

4. Minimize the likelihood of incidental take from sedimentation and chemical contamination by ensuring that effective erosion and pollution control measures are developed and implemented.

5. Implement a comprehensive monitoring and reporting program to ensure these conservation measures are effective in minimizing the likelihood of take from permitted activities and that the proposed mitigation actions are performing adequately.

9.3 Terms and Conditions

To be exempt from the provisions of Section 9 of the ESA, the USACE must include permit requirements that require EWEB to comply with the following terms and conditions, which implement the reasonable and prudent measures described above for each category of construction activity.

1. *To implement Reasonable and Prudent Measure #1 (in-river work), the USACE shall ensure the following:*

   a. In-water work. Wherever possible, work within the active channel of all anadromous fish-bearing streams, or in systems which could potentially contribute sediment or toxicants to downstream fish-bearing systems, will be completed within the ODFW approved in-water work period.[13] Due to the length of time necessary to complete some of the facilities, some in-water construction will occur outside the in-water work guidelines, based on the schedule in Appendix A that was developed in consultation with ODFW specifically for construction at the Leaburg and Walterville projects, and which was approved previously by NMFS, USFWS and FERC.

      i. Work period extensions. If EWEB needs to extend the in-water work period from those identified in Appendix A, including those for work outside the wetted perimeter of the stream but below the ordinary high water mark, the extensions must be approved by biologists from the Services.

   b. Isolation of in-water work area. During in-water work, if listed fish may be present, including incubating eggs or juveniles, and the project involves either significant channel disturbance or use of equipment instream, EWEB will ensure that the work area is well isolated from the active flowing stream within a cofferdam (made out of sandbags, sheet pilings, inflatable bags, gravel berm, etc.), or similar structure, to minimize the potential for sediment entrainment. Furthermore, no ground or substrate disturbing action will occur within the active channel 300 feet upstream of potential spawning habitat as measured at the thalweg without isolation of the work area from flowing waters.

   c. Fish screen. Any water intake structure authorized under an Opinion issued by the Services must have a fish screen installed, operated and maintained in accordance to NMFS' fish screen criteria.[14]

[13] Oregon Department of Fish and Wildlife, *Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources*, 12 pp (June 2000)(identifying work periods with the least impact on fish) (http://www.dfw.state.or.us/ODFWhtml/InfoCntrHbt/0600_inwtrguide.pdf).

[14] National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996)(guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm).

d. Fish passage. Work will not inhibit passage of any adult or juvenile salmonid species throughout the construction period or after project completion. All culvert and road designs will comply with ODFW guidelines and criteria for stream-road crossings[15] with appropriate grade controls to prevent culvert failure due to changes in stream elevation. EWEB's construction activities will not modify channels that could adversely affect fish passage, such as by increasing water velocities.

e. Downstream juvenile passage. EWEB will notify NMFS when the temporary juvenile bypass will be watered so that NMFS engineers can inspect hydraulic conditions within the bypass facility.

2. To implement Reasonable and Prudent Measure #2 (fish rescue and salvage), the USACE shall ensure that:

a. Seine and release. Prior to and intermittently during pumping, EWEB will attempt to seine and release fish from the work isolation area as is prudent to minimize risk of injury. Fish salvage operations shall be consistent with the approaches and techniques developed in EWEB's Fish Salvage Plan (License article 422) that has been approved by ODFW for use in the Walterville Canal dewatering effort. These approaches and techniques include the following general measures.

   i. Seining will be conducted by or under the supervision of EWEB's fishery biologist and all staff working with the seining operation will have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.
   ii. ESA-listed fish will be handled with extreme care and kept in water to the maximum extent possible during seining and transfer procedures. Any transfer of ESA-listed fish will be conducted using a sanctuary net that holds water during transfer, whenever necessary to prevent the added stress of an out-of-water transfer.
   iii. Seined fish will be released as near as possible to capture sites.
   iv. If EWEB transfers any ESA-listed fish to third-parties other than the Services personnel, EWEB will secure written approval from the Services.
   v. EWEB will obtain any other Federal, state, and local permits and authorizations necessary for the conduct of the seining activities.
   vi. EWEB will allow the Services or their designated representatives to accompany field personnel during the seining activity, and allow such representative to inspect EWEB's seining records and facilities.
   vii. A description of any seine and release effort will be included in a post-project report, as described below under measure g. ii.

[15] Appendix A, Oregon Department of Fish and Wildlife Guidelines and Criteria for Stream-Road Crossings, in: G.E. Robison, A. Mirati, and M. Allen, *Oregon Road/Stream Crossing Restoration Guide: Spring 1999* (rules, regulations and guidelines for fish passage through road/stream crossings under the Oregon Plan) (http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/orfishps.htm).

3. To implement Reasonable and Prudent Measure #3 (responsible construction techniques), the USACE shall ensure the following:

a. Project design. EWEB will avoid, minimize, and mitigate impacts to natural resources from construction activities. Overall project design conditions (b.) - (i.) will be met.

b. Minimum area. Construction impacts will be confined to the minimum area necessary to complete the work project.

c. Pre-construction activities. EWEB will undertake the following actions prior to significant alteration of the action area.
   i. Boundaries of the clearing limits associated with site access and construction will be flagged to prevent ground disturbance of critical riparian vegetation, wetlands and other sensitive sites beyond the flagged boundary.
   ii. The following erosion control materials will be onsite.
      (1) A supply of erosion control materials (e.g., silt fence and straw bales) will be on hand to respond to sediment emergencies. Sterile straw or hay bales will be used when available to prevent introduction of weeds.
      (2) An oil absorbing, floating boom will be available on-site during all phases of construction whenever surface water is present.
   iii. All temporary erosion controls (e.g., straw bales, silt fences) will be in-place and appropriately installed downslope of project activities within the riparian area. Effective erosion control measures will be in-place at all times during the contract, and will remain and be maintained until such time that permanent erosion control measures are effective.

d. Site preparation. EWEB will prepare the site preparation the following manner, including removal of stream materials, topsoil, surface vegetation and major root systems.
   i. To the extent practicable, any instream large wood or riparian vegetation that is moved or altered during construction will stay on site or be replaced with a functional equivalent.
   ii. EWEB will minimize clearing and grubbing within 150 feet of any stream occupied by listed salmonids during any part of the year, or within 50 feet of any stream not occupied by listed salmonids.
   iii. Tree removal will be strictly limited.
      (1) All perennial and intermittent streams: Trees (3 inches diameter at breast height or greater) will be removed from within 150 feet horizontal distance of the ordinary high water mark only when necessary for construction of approved facilities. All trees that will be removed will be flagged.
      (2) Tree removal will be mitigated for onsite by a 2:1 replanting ratio.

iv. Whenever the project area is to be revegetated or restored, EWEB will stockpile native channel material, topsoil and native vegetation removed for the project for redistribution on the project area.

e. Cessation of work. EWEB will cease all project operations, except efforts to minimize storm or high flow erosion, under high flow conditions that may result in inundation of the project area.

f. Temporary access roads. EWEB will design temporary access roads as follows:
   i. Existing roadways or travel paths will be used whenever reasonable.
   ii. A helicopter survey conducted with ODFW during the 2001 spawning season located spawning habitat; where stream crossings are essential, EWEB will avoid any spawning habitat within 1,000 feet upstream and downstream.
   iii. No stream crossings will occur at known or suspected spawning areas or within 300 feet upstream of such areas where impacts to spawning areas may occur.
   iv. Where stream crossings are essential, EWEB's crossing design will accommodate reasonably foreseeable risks (e.g., flooding and associated bedload and debris) to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.
   v. EWEB vehicles and machinery will cross riparian areas and streams at right angles to maintain the main channel wherever reasonable.
   vi. EWEB's temporary roads within 150 feet of streams will avoid, minimize and mitigate soil disturbance and compaction by clearing vegetation to ground level and placing clean gravel over geotextile fabric.
   vii. EWEB will minimize the number of stream crossings.

g. Treated wood removal. EWEB will use the following precautions regarding removal of treated wood.
   i. No treated wood debris will fall into the water. If treated wood debris does fall into the water, it will be removed immediately.
   ii. All treated wood debris will be disposed of at an approved disposal facility for treated wood.
   iii. If treated wood pilings will be removed, EWEB will ensure these conditions are followed:
      (1) Pilings to be removed will be dislodged with a vibratory hammer, or other means acceptable to the Services.
      (2) Once loose, the pilings will be placed onto the construction barge or other appropriate dry storage location, and not left in the water or piled onto the stream bank.
      (3) If pilings break during removal, the remainder of the submerged section will be left in place.
      (4) Long-term disposal of the piles must be at an approved disposal area for

hazardous materials of this classification.

(5) Projects involving pile removal require long-term monitoring to ensure that if altered currents expose more pile, it must also be removed.

h. Heavy Equipment. EWEB will restrict use of heavy equipment as follows.

i. When heavy equipment is required, EWEB will use equipment having the least impact (e.g., minimally sized, rubber tired).

ii. Heavy equipment will be fueled, maintained and stored as follows.

(1) All equipment that is used for instream work will be cleaned prior to operations below the bankfull elevation. External oil and grease will be removed, along with dirt and mud. No wash and rinse water will be discharged into streams and rivers without adequate treatment.

(2) Place vehicle staging, maintenance, refueling, and fuel storage areas a minimum of 50' horizontal distance from the McKenzie River for the Leaburg left bank fish ladder modification. The staging area for Leaburg right bank fish ladder reconstruction will be within 50' of the McKenzie River. The Pollution and Erosion Control Plan will prevent point-source pollution of the river.

(3) All vehicles operated within 150 feet of any stream or water body will be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected will be repaired before the vehicle resumes operation.

(4) When not in use, vehicles will be stored in the vehicle staging area.

i. Earthwork. EWEB will complete earthwork, including drilling, blasting, excavation, dredging, filling and compacting, in the following manner:

i. Boulders, rock, woody materials and other natural construction materials used for the project will be obtained from outside of the riparian area.

ii. During excavation, native streambed materials will be stockpiled above the bankfull elevation for later use. If riprap is placed, native materials will be placed over the top of the riprap.

iii. Material removed during excavation will only be placed in locations where it cannot enter streams or other water bodies.

iv. All exposed or disturbed areas will be stabilized to prevent erosion.

(1) Areas of bare soil within 150 feet of waterways, wetlands or other sensitive areas will be stabilized by native seeding,[16] mulching, and placement of erosion control blankets and mats, if applicable, quickly as reasonable after exposure, but within 7 days of exposure.

(2) All other areas will be stabilized quickly as reasonable, but within 14 days of exposure.

[16] By Executive Order 13112 (February 3, 1999), Federal agencies are not authorized to permit, fund or carry out actions that are likely to cause, or promote, the introduction or spread of invasive species. Therefore, only native vegetation that is indigenous to the project vicinity, or the region of the state where the project is located, shall be used.

(3) Seeding outside of the growing season will not be considered adequate nor permanent stabilization.

v. All erosion control devices will be inspected during construction to ensure that they are working adequately.

(1) Erosion control devices will be inspected daily during the rainy season, weekly during the dry season, monthly on inactive sites.

(2) If inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately, during working and off-hours, to make repairs, install replacements, or install additional controls as necessary.

(3) Erosion control measures will be judged ineffective when turbidity plumes are evident in waters occupied by listed salmonids during any part of the year.

vi. If soil erosion and sediment resulting from construction activities is not effectively controlled, EWEB will limit the amount of disturbed area to that which can be adequately controlled.

vii. Sediment will be removed from sediment controls once it has reached 1/3 of the exposed height of the control. Whenever straw bales are used, they will be staked and dug into the ground 5 inches (12 cm). Catch basins will be maintained so that no more than 6 inches (15 cm) of sediment depth accumulates within traps or sumps.

viii. Sediment-laden water created by construction activity will be filtered before it enters a stream or other water body. Silt fences or other detention methods will be installed as close as reasonable to culvert outlets to reduce the amount of sediment entering aquatic systems.

j. Site restoration. EWEB will restore and clean up the site, including protection of bare earth by seeding, planting, mulching and fertilizing, in the following manner.

i. All damaged areas will be restored to pre-work conditions including restoration of original streambank lines, and contours.

ii. All exposed soil surfaces, including construction access roads and associated staging areas, will be stabilized at finished grade with mulch, native herbaceous seeding, and native woody vegetation prior to October 1. On cut slopes steeper than 1:2, a tackified seed mulch will be used so that the seed does not wash away before germination and rooting occurs. In steep locations, a hydro-mulch will be applied at 1.5 times the normal rate.

iii. Disturbed areas will be planted with native vegetation specific to the project vicinity or the region of the state where the project is located, and will comprise a diverse assemblage of woody and herbaceous species.

iv. Plantings will be arranged randomly within the revegetation area.

v. All plantings will be completed prior to April 15.

vi. No herbicide application will occur within 300 feet of any stream channel as part of this permitted action. Undesired vegetation and root nodes will be mechanically removed.

vii. No surface application of fertilizer will be used within 50 feet of any stream channel.

viii. Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

ix. Plantings will achieve an 80 percent survival success after three years.

(1) If success standard has not been achieved after 3 years, EWEB will submit an alternative plan to the COE. The alternative plan will address temporal loss of function.

(2) Plant establishment monitoring will continue and plans will be submitted to the COE until site restoration success has been achieved.

4. To implement Reasonable and Prudent Measure #4 (pollution and erosion control), the USACE shall ensure the following:

a. Pollution and erosion control plan. A PECP will be developed for each authorized project to prevent point-source pollution related to construction operations. For the Leaburg and Walterville construction activities, EWEB is required to develop and submit for FERC approval a PECP for construction and operation as described in license article 401. In addition to meeting the license article requirements, EWEB ensures the PECP will contain the pertinent elements listed below and meet requirements of all applicable laws and regulations:

i. Methods that will be used to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.

ii. Methods that will be used to confine and remove and dispose of excess concrete, cement and other mortars or bonding agents, including measures for washout facilities.

iii. A description of the hazardous products or materials that will be used, including inventory, storage, handling, and monitoring.

iv. A Spill Containment and Control Plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on site, proposed methods for disposal of spilled materials, and employee training for spill containment.

v. Measures that will be taken to prevent construction debris from falling into any aquatic habitat. Any material that falls into a stream during construction operations will be removed in a manner that has a minimum impact on the streambed and water quality.

b. Wastewater filtering. Sediment-laden or contaminated water pumped from the work isolation area will be discharged into an upland area where practicable providing over-ground flow prior to returning to the canal or river. Discharge will occur in such a manner as not to cause erosion. For areas where no upland area is present, e.g., the right bank fish ladder, EWEB will assure the discharge is filtered prior to being returned to the river and filtered material is not released back to the river upon removal. EWEB will not discharge into potential fish spawning areas or areas with submerged vegetation.

c. Additional EWEB monitoring. EWEB will have two full-time inspectors in the field monitoring construction practices, including compliance with EWEB's Proposed Measures, and the PECP.[17] Implementation of the FERC-required Quality Control Inspection Program[18] is designed to ensure environmental compliance quality control. The QCIP requires monthly progress reports regarding quality control of environmental protection measures, including the following: discussion of erosion control and other measures and their effectiveness; discussion of any instances where sediments or other construction discharges entered the stream(s); the extent of the discharges, an assessment of any damage to the stream(s); and corrective actions taken, including measures to prevent further problems. EWEB will also perform periodic, random site visits throughout the work period, accompanying the full-time inspectors on site inspections and ensuring thorough inspection and enforcement of environmental measures. EWEB will send email summary reports of these visits to NMFS. EWEB will also enforce the following items from the Pollution and Erosion Control Details and Requirements found in sheet ES-1 of each contract document:
   i. Items 2 and 7: Requires the contractor to adjust the approved PECP as required for field conditions,
   ii. Item 9: Requires contractor inspection of erosion control facilities after significant rainfall events,
   iii. Items 15 and 6: EWEB can halt construction if the contractor is not maintaining proper erosion and pollution control measures and the contractor is responsible for payment of any agency-imposed fines.

5. To implement Reasonable and Prudent Measure #5 (monitoring), the USACE shall ensure the following:

a. Construction Monitoring. Within 30 days of completing the project, EWEB will submit a monitoring report to the USACE, DSL, and the Services describing EWEB's success in carrying out the proposed measures to avoid, minimize, and mitigate for construction-related impacts. This report will consist of the following information:
   i. Project identification.

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[17] In an email dated April 30, 2002, EWEB amended its proposed action to include these oversight measures.

[18] The Quality Control Inspection Program (QCIP) is a general requirement of FERC, not specific to the Leaburg-Walterville License.

(1) Applicant's name,
(2) project name,
(3) construction activity,
(4) compensatory mitigation site(s) (if any) by 5th field HUC and latilong,
(5) starting and ending dates for work performed, and
(6) EWEB's contact person.

ii. Isolation of in-water work area. All projects involving isolation of in-water work areas will include a report of any seine and release activity including:
(1) The name and address of the supervisory fish biologist,
(2) methods used to isolate the work area and minimize disturbances to ESA-listed species,
(3) stream conditions prior to and following placement and removal of barriers;
(4) the means of fish removal,
(5) the number of fish removed by species,
(6) the location and condition of all fish released, and
(7) any incidence of observed injury or mortality.

iii. Pollution and erosion control. Copies of all pollution and erosion control inspection reports, including descriptions of any failures experienced with erosion control measures, efforts made to correct them and a description of any accidental spills of hazardous materials will be submitted.

iv. Treated wood pilings. Any project involving removal of treated wood pilings will include the name and address of the approved disposal area and the plan for long-term monitoring to ensure that if altered currents expose more pile, it will also be removed.

v. Site restoration. Documentation of the following conditions:
(1) Finished grade slopes and elevations.
(2) Log and rock structure elevations, orientation, and anchoring, if any.
(3) Planting composition and density.
(4) A plan to inspect and, if necessary, replace failed plantings and structures for a period of five years.

vi. A narrative assessment of the project's effects on natural stream function.

vii. Photographic documentation of environmental conditions at the project site and compensatory mitigation site(s) (if any) before, during and after project completion.
(1) Photographs will include general project location views and close-ups showing details of the project area and project, including pre and post construction.
(2) Each photograph will be labeled with the date, time, photo point, project name, the name of the photographer, and a comment describing the photograph's subject.
(3) Relevant habitat conditions include characteristics of channels, streambanks, riparian vegetation, flows, water quality, and other visually discernable environmental conditions at the project area, and upstream and downstream of the project.

10. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS did not identify any conservation recommendations in this biological opinion.

11. REINITIATION OF CONSULTATION

This concludes formal consultation on the USACE action described in the BA (USACE 2002) for construction activities at EWEB's Leaburg Dam fish ladders. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take specified in the incidental take statement is exceeded, or is expected to be exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or, 4) a new species is listed or critical habitat designated that may be affected by the action (50 CFR §402.16). In instances where the amount or extent of incidental take specified in the Incidental Take Statement is exceeded, USACE must notify the Services and reinitiate consultation immediately [(50 CFR §402.14(i)(4)].

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13. ESSENTIAL FISH HABITAT

13.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));
- NMFS must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A));
- Federal agencies must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR §600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR §600.810).

EFH consultation with NMFS is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

13.2 Identification of EFH

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically, accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

13.3 Proposed Action

The proposed action and action area are detailed above in Section 3 of this biological opinion. The action area includes habitats that have been designated as EFH for various life-history stages of chinook salmon.

13.4 Effects of the Proposed Action

As described in detail in Section 6 of this biological opinion, the proposed action may result in short-term adverse effects to a variety of habitat parameters. The proposed action may result in a short-term disturbance of stream bed material, a short-term increase in turbidity and sediment levels, and a temporary reduction in riparian vegetation. Chemical contaminants could enter the river due to the close proximity of the construction staging area to the river, but this risk is low due to implementation of conservation measures described in the action agency's proposed action and the terms and conditions of this biological opinion.

13.5 Conclusion

NMFS concludes that the proposed action may adversely affect designated EFH for chinook salmon.

13.6 EFH Conservation Recommendations

Persuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. The conservation measures that the USACE included in the proposed action and all of the Terms and Conditions contained in Section 9.3 of this biological opinion apply to salmon EFH. Consequently, NMFS recommends that they be adopted as EFH conservation measures.

13.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR §600.920(j), Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

13.8 Supplemental Consultation

The USACE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR §600.920(k)).

13.9 References

PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.

APPENDIX A

CONSTRUCTION SCHEDULE

Project Name: Leaburg-Walt. Group **Filter:** AAA- Construction for Article 403

#	Task Name	Start	Finish
754	**PHYSICAL PLANT SCHEDULE**	**03/24/00**	**12/23/03**
765	**Walterville Outage Project SCREEN/DIVERSION**	**03/24/00**	**12/23/02**
787	**Construction Phase**	**02/13/02**	**12/23/02**
788	EWEB Issue Notice to Proceed	02/13/02	02/13/02
789	Contractor Complete Outage Prepartions	02/14/02	04/30/02
790	EWEB Dewater/Fish Salvage	05/01/02	05/14/02
791	Contractor Outage Work	05/20/02	10/22/02
792	Contractor Complete In-River Work	07/01/02	08/30/02
793	Replace Cribbing w/Rock	07/01/02	08/30/02
794	Construct Rock Weirs	07/01/02	08/30/02
795	Construct Fish Return Outfall	07/01/02	08/30/02
796	Complete In-River Work	08/30/02	08/30/02
797	Outage Ends	10/22/02	10/22/02
798	Contractor Complete Remaining Post Outage Work	10/23/02	12/23/02
799	Startup & Testing	10/23/02	12/03/02
800	Screen Project Complete	12/23/02	12/23/02
801	**Walterville Outage Project TAILRACE BARRIER**	**03/24/00**	**10/01/02**
823	**Construction Phase**	**01/28/02**	**10/01/02**
824	EWEB Issue Notice to Proceed	01/28/02	01/28/02
825	Contractor Complete Outage Prepartions	01/29/02	04/30/02
826	EWEB Dewater/Fish Salvage	05/01/02	05/14/02
827	Contractor Outage Work	05/15/02	08/30/02
828	Contractor Complete In-River Work	05/15/02	08/30/02
829	Construct Coffer Dam	05/15/02	05/21/02
830	Remove Coffer Dam	08/26/02	08/30/02
831	In River Work Ends	08/30/02	08/30/02
832	Contract Finishes Work	09/02/02	10/01/02
833	Tailrace Barrier Project Complete	10/01/02	10/01/02
834	**Walterville Outage Project TAILRACE EXCAVATION**	**03/24/00**	**11/21/02**
856	**Construction Phase**	**01/28/02**	**11/21/02**
857	EWEB Issue Notice to Proceed	01/28/02	01/28/02
858	Contractor Outage Prepartions	01/29/02	04/29/02
859	EWEB Dewater/Fish Salvage	05/01/02	05/14/02
860	Contractor Construct Outage Work	05/15/02	10/22/02
861	Outage Ends	10/22/02	10/22/02
862	Contractor Complete Post Outage Work	10/23/02	11/21/02
863	Tailrace Excavation Project Complete	11/21/02	11/21/02
894	**Leaburg Non-Outage Project RB FISH LADDER**	**03/24/00**	**11/13/02**
916	**Construction Phase**	**01/30/02**	**11/13/02**
917	EWEB Issue Notice to Proceed	01/30/02	01/30/02
918	Contractor Complete Pre In-River Work	01/31/02	05/10/02

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#	Task Name	Start	Finish
919	Contractor Mobilize & Complete Critical Submittals	01/31/02	03/08/02
920	Early Material Procurements	03/11/02	03/29/02
921	Construct Erosion Control	04/01/02	04/05/02
922	Construct Temp Riverside Access Road	04/08/02	04/26/02
923	Construct Temp Fish Return Pipe	04/29/02	05/10/02
924	In-River Work	05/13/02	06/11/02
925	Temp. Fish Return Pipe, Coffer Dam, DEW System, Boulder Removal	05/13/02	06/11/02
926	Ladder & Misc Concrete	06/12/02	09/25/02
927	Ladder Concrete	06/12/02	09/11/02
928	Fish Return Channel Mods	09/12/02	09/25/02
929	Mechanical/Electrical	09/26/02	10/30/02
930	Screen/Gate Mechanical	09/26/02	10/16/02
931	Electrical	10/17/02	10/30/02
932	Final Work	10/31/02	11/13/02
933	Remove Coffer Dam	10/31/02	11/06/02
934	Ladder Operation Flow Adjustments	11/07/02	11/13/02
935	Right Bank Fish Ladder Project Complete	11/13/02	11/13/02
936	**Leaburg Non-Outage Project LB FISH LADDER**	**03/24/00**	**10/29/03**
958	**Construction Phase**	**05/02/03**	**10/29/03**
959	EWEB Issue Notice to Proceed	05/02/03	05/02/03
960	Contractor Construct LB Fish Ladder Improvements	05/02/03	09/12/03
961	Contractor Mobilize & Complete Critical Submittals	05/02/03	06/03/03
962	Early Material Procurements	06/03/03	06/24/03
963	Construct Erosion Control	06/24/03	07/01/03
964	Ladder Out of Service	07/01/03	07/01/03
965	Concrete Construction	07/01/03	08/15/03
966	Mechanical	08/15/03	08/29/03
967	Electrical	08/29/03	09/12/03
968	Ladder Back in Service	09/12/03	09/12/03
969	Final Work	09/12/03	10/29/03
970	Finish Grade, Fencing, Recreation Improvements	09/12/03	10/29/03
971	Project Complete	10/29/03	10/29/03
972	**Leaburg Maintenance Projects - Non-Outage**	**03/24/00**	**09/17/03**
973	**LEABURG ROLLER GATE IMPROVEMENTS (Internal Reinf)**	**03/24/00**	**09/17/03**
1003	Construction Phase (2002 & 2003)	05/02/02	09/17/03
1004	2002 Roller Gate Work (No.1)	05/02/02	11/05/02
1005	EWEB Issue Notice to Proceed - 2002 Work	05/02/02	05/02/02
1006	Contractor Critical Submittals	05/03/02	05/30/02
1007	Contractor Procure Critical Materials	05/31/02	08/30/02
1008	Install Timber Isolation @ Gate No.1	09/02/02	09/13/02
1009	Modify Gate No.1 (Steel Reinforcing)	09/16/02	10/15/02
1010	Paint Gate No.1 & Return to Service	10/16/02	11/05/02
1011	2002-2003 Wet Weather Off Period	11/06/02	05/01/03
1012	No Work Period	11/06/02	05/01/03

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#	Task Name	Start	Finish
1013	2003 Roller Gate Work (No.2 and No.3)	05/02/03	09/17/03
1014	2003 Install Timber Isolation @ Gate No.2	05/02/03	05/12/03
1015	Modify Roll Gate No.2 (Steel Reinforcing)	05/13/03	06/11/03
1016	Paint Roll Gate No.2 & Return to Service	06/12/03	07/02/03
1017	Remob for Gate No.3	07/03/03	07/09/03
1018	Install Timber Isolation @ Gate No.3	07/10/03	07/23/03
1019	Modify Roll Gate No.3	07/24/03	08/22/03
1020	Paint Roll Gate No.3 & Return to Service	08/25/03	09/12/03
1021	Roll Gate Work Complete	09/12/03	09/12/03
1022	Demobilize	09/15/03	09/17/03
1023	**Leaburg Non-Outage Project LAKE RAISE**	**09/28/01**	**10/22/03**
1046	**Construction Phase**	**04/21/03**	**10/22/03**
1047	EWEB Issue Notice to Proceed	04/21/03	04/21/03
1048	Construct Lake Raise Improvements	04/22/03	10/22/03
1049	Contractor Mobilize & Complete Critical Submittals	04/22/03	05/26/03
1050	Early Material Procurements	05/27/03	06/25/03
1051	Construct Erosion Control	06/26/03	07/02/03
1052	Construct Lake Raise Improvements- In and Out of River	07/03/03	10/22/03
1053	Out of River Work	07/03/03	10/22/03
1054	In River Work	07/03/03	08/29/03
1055	Lake Raise Improvements Complete	10/22/03	10/22/03
1056	**Leaburg Outage Project TAILRACE BARRIER**	**06/08/01**	**11/11/03**
1081	**Construction Phase**	**03/27/03**	**11/11/03**
1082	EWEB Issue Notice to Proceed	03/27/03	03/27/03
1083	Contractor Outage Prepartions	03/28/03	04/30/03
1084	EWEB Dewater/Fish Salvage	05/01/03	05/14/03
1085	Contractor Construct Outage Work	05/15/03	10/01/03
1086	In-River Work	04/11/03	10/15/03
1087	Prep for In-River Work	04/11/03	05/12/03
1088	Place Tailrace Coffer Dam	05/15/03	06/04/03
1089	Remove Coffer Dam	10/09/03	10/15/03
1090	Outage Ends	10/22/03	10/22/03
1091	Contractor Complete Post Outage Work	10/23/03	11/11/03
1092	Leaburg Tailrace Barried Project Complete	11/11/03	11/11/03
1093	**Leaburg Outage Project SCREEN**	**09/28/01**	**12/23/03**
1115	**Construction Phase**	**04/03/03**	**12/23/03**
1116	EWEB Issue Notice to Proceed	04/03/03	04/03/03
1117	Contractor Outage Prepartions	04/04/03	05/14/03
1118	EWEB Dewater/Fish Salvage	05/01/03	05/14/03
1119	Contractor Construct Outage Work	05/15/03	10/08/03
1120	Outage Ends	10/22/03	10/22/03
1121	Contract Complete Remaining Post Outage Work	10/23/03	12/23/03
1122	Startup & Testing	10/23/03	12/23/03
1123	Screen Project Complete	12/23/03	12/23/03

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